IMPERIAL AGRICULTURAL
RESEARCH INSTITUTE, NEW DELHI.

BULLETIN OF MISCELLANEOUS
INFORMATION No. 1 1933
ROYAL BOTANIC GARDENS, KEW

I.—MOXON MEMORIAL BEQUEST.

Towards the close of the year 1915 an official letter was received from a firm of London solicitors stating that certain clients of theirs were settling a sum of money for the purpose of establishing a fund, to be called " the A.B. and C.D. Memorial Fund," for furthering the study of Botany, but the names of the clients were not disclosed. The solicitors were duly informed that a bequest of this character might be linked with that of the Bentham Trust, should that be so desired, and there the matter rested for some time. It will be remembered that a few years later, the Herbarium collection of plant drawings was greatly enriched by the presentation to Kew by Mr. Alfred Edward Moxon of a very beautiful collection of water-colour drawings of Swiss Alpine plants, made by his Sister, the late Miss Margaret Louisa Moxon. She had during many years painted some 1,000 portraits of Swiss Alpine flowers, and these, thanks to the generosity of Mr. A. E. Moxon, have all been catalogued and accurately named, and are available for study in the Herbarium. An account of this bequest was given in Kew Bulletin, 1920, 371.

In connection with this gift a visit was paid to Mr. Moxon at New Milton, Hants, in October 1920, when he handed over the drawings and presented them to Kew in accordance with the wishes of his Sister. This visit was the only occasion on which anyone from Kew met Mr. Moxon, though after the visit a fairly regular correspondence was maintained with him until shortly before his death at Lausanne on May 26th, 1930.

After his death it transpired that it was Mr. A. E. Moxon and his Sister who were the clients referred to in the letter received at Kew in 1915.

We were informed by the Public Trustee, their executor, that Mr. Moxon and Miss Moxon had bequeathed the residue of their estates, subject to a life interest to the survivor of them, to the Bentham Trustees, and by a voluntary settlement, executed in 1916, had settled upon trust certain stocks and securities which, upon the death of the survivor of them, should likewise be transferred to the Bentham Trustees to establish a Fund to be called " the James Edward and Louisa Sarah Moxon Memorial Fund " and " to be applied and administered by the Bentham Trustees along with the Bentham Fund for furthering the study of Botany, the publishing of works on flowers and botany and the making of grants for [illegible] botanists for lectures and for the purpose of botanical literary collections and books on botany for use at Kew Gardens, and for any other purpose for which the Bentham Fund might be used and applied." The two funds have now been united under the title of "The Bentham-Moxon Fund" and are administered by the Trustees.

Beyond the one visit to Mr. Moxon at New Milton, Kew unfortunately has known very little about either Mr. A. E. Moxon or his Sister, Miss M. L. Moxon, and we are therefore unaware of the exact reasons which led them to make so generous a bequest to the Royal Botanic Gardens, other than the keen interest they both shared in the flowers of the Swiss mountains.

We learn from Miss Florence Penrose Moxon, his cousin, that Mr. Moxon, on his Mother's side, was a lineal descendant of Sir Francis Drake, and he had always made Sir Francis Drake and Sir Walter Raleigh his two heroes ; he also belonged to the old family of Penrose of Penrose, Cornwall, and as a memorial to his Mother he bequeathed his books to the Library of the City of Plymouth. Mr. Moxon was very greatly handicapped by his eyesight and in his younger days he could do nothing and could only see with very great difficulty. Later in life, as the result of a successful operation, he regained his sight to some degree and was able to read the books, mainly of travel, with which his shelves were richly stored. When I paid a visit to him in 1920 to examine Miss Moxon's drawings, it was very interesting to hear from him of his joy in the novel experience of being able to read his books and to see and appreciate to the full, after having been nearly blind for almost the first thirty years of his life, the beauty of the Alpine flowers, which he had learnt to love from the descriptions of his Mother and Sister. A. W. H.

II.—TANKERVILLE COLLECTION OF DRAWINGS.

A valuable collection of 648 original coloured drawings of plants, contained in 15 volumes, has been presented by the Bentham Trustees. Among them are 29 signed by G. D. Ehret, bearing dates ranging from 1756 to 1770, and 17 without signature, initials or date, probably by Ehret. Most of the others, which have dates ranging from 1783 to 1824, are apparently by Margaret Meen, though only 69 of them are initialled by her, and only three signed "M. Meen." Usually when there are the initials "M. M." they are so small as to be scarcely legible. A few other artists have contributed to the collection, one of whom was Lady Tankerville, whose work is represented by 22 paintings of plants made in Madeira in 1811 and 1812. The latest date observed is October, 1824, and that is on an anonymous drawing of a *Salvia*. Two drawings signed "M. Meen" are dated 1819, and two initialled "M.M." are dated 1820. Most of the drawings are on vellum, the sheets varying in size from 11 by 8 inches up to 26 by 18½ inches. Ehret's are usually on sheets measuring about 19 by 13 inches. All are named; those attributed to

Margaret Meen have as a rule names and other information taken from Aiton's " Hortus Kewensis." Plants from various parts of the world are depicted, a good number being Francis Masson's introductions from the Cape. A few are British. This collection was formerly in the library of the Earl of Tankerville at Chillingham Castle, Northumberland. Presumably the types of very many of the drawings were procured from the gardens there. The beauty of Ehret's paintings is well known. Little is recorded of Margaret Meen, but her work, as shown in the fragment published as " Exotic plants from the Royal Gardens at Kew," in 1790, is regarded as that of a talented artist. This work is the subject of notes in Kew Bull. 1893, 147, and Gard. Chron. 1894, xv. 197. She is known to have exhibited at the Royal Academy from 1775 to 1785, but she had not been traced after 1790. We have now ascertained that she was carrying on her work up to 1820. The numerous drawings by her in our possession provide ample evidence that Margaret Meen was a highly accomplished artist. In addition to the original drawings there are 20 coloured engravings or lithographs from drawings by Margaret Meen, G. D. Ehret, James Sowerby and Francis Bauer. These were published in M. Meen's work mentioned above, in Ehret's " Plantae Selectae," in Aiton's " Hortus Kewensis," and in Bauer's " Strelitzia depicta."

III.—THE STRUCTURE AND BOTANICAL IDENTITY OF SOME SCENTED WOODS FROM THE EAST.

C. R. METCALFE.

During the last few years a number of scented wood specimens from Bangkok and other places in the East have been submitted for identification to the Jodrell Laboratory. Many of these, which pass under the local name of " Calambac " or similar names, have been sent by Dr. A. Kerr of the Botanical Section, Ministry of Commerce and Communications, Bangkok. In the course of examining these and other woods it has become increasingly clear that very great confusion exists concerning their botanical identity, due chiefly to a number of quite distinct species having acquired very similar vernacular and trade names. In the following pages the wood structure of each of these species is described and a list of the names (omitting a few variations in spelling) by which they are known individually, with some notes on their sources and uses, is given.

Unless stated to the contrary all the wood specimens examined are now in the Kew collections; and their reference numbers have been given in the lists of material at the end of each species. These are represented by the hyphened numbers. Where single numbers only have been given, these represent the years in which the material was received. The place of origin of each specimen, together with the collector's name, has also been added wherever possible.

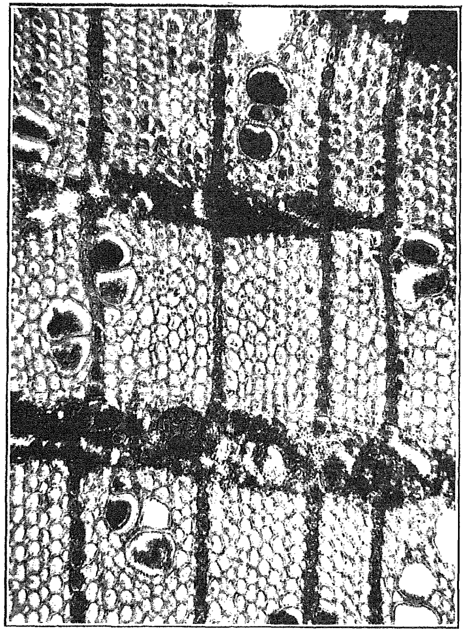
Aquilaria Agallocha *Roxb.* (Thymelaeaceae). Fig. 1.

A very full account of the wood of this species is given by Hooper (7), from whose paper a great deal of the following information, apart from anatomical characters, has been drawn. An earlier account, with some anatomical characters, is also given by Moeller (9). *Aquilaria Agallocha* is a large tree native of the mountains east and south-east of Sylhet, and is found abundantly at Tenasserim in Burma. Usually the wood is light, pale and unscented, but in certain circumstances a resinous deposit is formed in the branches and trunk, and the specific gravity of the wood increases. The heavy wood thus formed is collected, and constitutes the drug known as "Agar." What causes the resin to be deposited is uncertain, but it is generally held that it appears after an injury has been sustained. The drug is sold in pieces which are very irregular in size and shape, varying from small splinters to pieces weighing about a pound. It is of interest that Hooper mentions a substitute for this wood which is imported to Bombay and Calcutta from Zanzibar. The botanical origin of this substitute was unknown when his paper was written (in 1904) but in the light of the present investigation it seems probable that it may well be the wood of *Cinnamosma fragrans* described below. (According to Watt, "Dictionary of Economic Products of India," Calcutta, 279 (1899), Guibourt suggested that *Excoecaria Agallocha* L. is also used as a substitute for *Aquilaria Agallocha*. Watt also mentions that "Taggar" and "False Aloes Wood" are imported to India from Zanzibar.) According to Hooper, the wood of this species appears to have been valued from the earliest times on account of its perfume and supposed medicinal properties. It is now used principally in China for burning as incense, and in the manufacture of joss-sticks. An oil known as "Aggar-Atta" is extracted from it at Sylhet. Other uses of the wood are stated to be (1) for the manufacture of rosaries, (2) for burning the dead bodies of Hindus, (3) as a preventive against fleas and lice, (4) taken internally as a stimulant and cordial in "gout, rheumatism and paralysis, and also as a stimulant astringent in diarrhoea and vomiting."

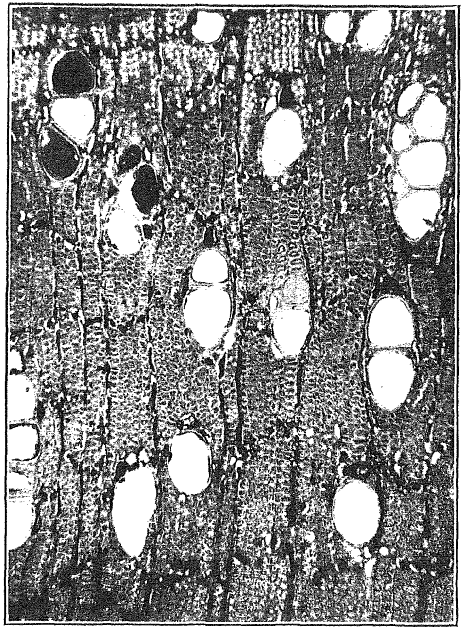
WOOD STRUCTURE.

The most striking character clearly visible with a lens is the presence of dark-coloured areas throughout the wood. In transverse sections these appear as patches of varying size and shape, ranging from comparatively small circular areas to larger ones elongated tangentially, usually rounded at the narrow ends, but sometimes terminating in points. In the material available it was not possible to follow the mode of formation of these areas, but they appeared to consist largely of rather thick-walled parenchyma cells, almost all of which were completely filled with resinous material. Medullary rays were often incorporated in these patches. Moeller (l.c.) regarded them as intraxylary phloem. They varied in size from 0·25 mm. in a tangential direction and 0·12 mm. radially to 2·3 mm.

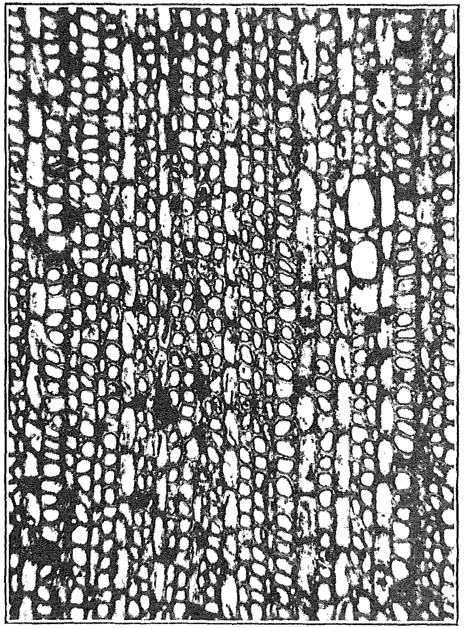
PLATE I



1. *Aquilaria Agallocha* Roxb. Indian Forestry Department, 1879. Transverse section. ×90.



2. *Excoecaria africana* Muell. Arg. Transvaal. J. Burtt-Davy. 52–1920. Transverse section. ×90.



3. *Euphorbia antiquorum* L. S. Jayeteleke. Ceylon. Transverse Section. ×90.

or more tangentially and 0·8 mm. radially. These resin-filled areas were not observed in any of the other woods under consideration except *Aquilaria malaccensis*, so they may be taken as a distinctive character of the genus *Aquilaria* for the purposes of the present paper. Intraxylary phloem was also present in samples of the normal wood which did not contain the valuable resin, but here the cells of which it was composed were devoid of contents and were not so clearly visible under a lens.

Pores thick-walled, sometimes solitary, but chiefly in short radial chains; considerable variation in the size of the individual pores, ranging from 24μ radial and 40μ tangential diameter to 100μ diameter in both directions. Deposits present in most of the vessels, especially the smaller ones. Vessel perforations simple. Intervascular pits minute, bordered. Parenchyma rare (apart from the patches already described). Rays predominantly uniseriate, sometimes biseriate for a part of their height, heterogeneous, all cells filled with dense contents, 1–29 cells (predominantly about 9 cells) high, individual cells 20–28μ high. Wood fibres (tracheids) with wide lumen, bordered pits small, unevenly distributed.

TRADE AND LOCAL NAMES.

"Eagle wood," "Aloe wood," "Lignum aloes," "Pao Daguila-aloes wood," "Kulambak," "Aguila wood," "Aggar," "Tugge," "Agallochum xylo," "Paradise wood," "Linaloeholz," "Adlerholz," "Lignum agallochi," "Lignum aquila," "Lignum aquilariae," "Lignum aspalathi," "Xylaloe," "Kayu garu" (Malay), "Calambac," "Colombac," "Kalambac," "Kalumback," "Lign aloes."

MATERIAL EXAMINED.

(1) "Lign aloes." Silhet. J. D. Hooker. (2) "Eagle wood." Indian Forestry Department, 1879. (3) Gologhat, Assam. Indian Forestry Department, 1878. (4) "Agar." India, 77–1900.

Aquilaria malaccensis *Lamk.* (Thymelaeaceae).

According to Heyne (6) *Aquilaria malaccensis* Lamk. is a tree 50–60 feet high and 1½ ft. thick, with a whiteish, smooth bark. It grows on high ground in the Malay Archipelago. The wood is white, light and soft unless it contains resin. It is stated that fallen trees sink into the ground, and in these circumstances the wood rots and the resin-containing portions are extracted. Heyne does not agree with the suggestion that the wood is deliberately buried in order to induce the formation of the resinous deposit, but mentions that the natives bore holes in the trunk in which they insert salt to assist in the production of resin. The bark yields a fibre used in the manufacture of ropes, loin-cloths, etc.

WOOD STRUCTURE.

The wood is very similar to that of *Aquilaria Agallocha*, but features by which it may sometimes be distinguished from that species are the relative rarity of solitary pores and the more frequent occurrence of large aggregates of vessels (up to 16 in a group). However, considerable variations were noted, so that it is inadvisable to rely too fully on these characters. It was not found possible to substantiate the conclusion of Moeller (l.c.) that *A. malaccensis* can be distinguished from *A. Agallocha* by having more strongly thickened elements, and by the possession of crystals in the parenchyma cells of the rays. On the other hand some support was found for the suggestion that biseriate rays are more frequent in *A. malaccensis* than in *A. Agallocha*.

MATERIAL EXAMINED.

(1) Philippines. Imperial Forestry Institute 5271 and 5272. (2) Federated Malay States. Imperial Forestry Institute 5752. (3) Malacca. Kew Museum Y6421. (4) Cochin China, Paris Exhibition, 1878.

Excoecaria africana *Muell. Arg.*—*Spirostachys africana* Sond. (Euphorbiaceae). Fig. 2.

The wood of this species is of interest in this paper chiefly because it has been confused with that of *Cinnamosma fragrans* Baill., a description of which is given below. The confusion appears to have arisen primarily on account of the strong superficial resemblance of the wood of the two species, which in turn probably led to a certain specimen in the Kew Museums being incorrectly labelled some years ago. Reference is made to this piece of wood in Kew Bull. 1888, 136, where the following statement occurs: "In the Kew Museums there is a specimen of wood labelled '*Santal Vert* (Croton sp.), exported from Madagascar and Zanzibar into India, where it is said to be used for burning the bodies of Hindoos.'" This specimen, still in the Kew collections, now proves to be identical with authentic material of *Cinnamosma fragrans* Baill., kindly supplied by Prof. S. J. Record from the wood collections of the Yale University School of Forestry. Later, other specimens from East Africa and Zanzibar came into the Kew collections, and presumably on account of their very strong superficial resemblance to the specimen of "Santal Vert" already mentioned, were believed to be species of *Croton*. During the present investigation it has been found that the dark-coloured, heavy, hard woods from East Africa and Zanzibar in the Kew collections labelled *Croton* sp. are some of them *Cinnamosma fragrans*, whilst the remainder agree with authentic material of *Excoecaria africana*.

This species is used as a substitute for Aloes wood, and in the manufacture of necklaces, charms, gunstocks, furniture, wagon work and ox yokes, and for placing amongst clothing to keep away moths.

WOOD STRUCTURE.

A description of the wood of *Excoecaria africana* and its source and uses has been given by Burtt-Davy (2). For the sake of completeness the description of the wood is here repeated verbatim.

" Heartwood dark brown, beautifully marked with darker streaks, sometimes becoming almost black ; a highly ornamental wood ; has a waxy appearance and feel. Sapwood much lighter in color. Scent strong and persistent, resembling that of Cedar and Sandal. Taste somewhat acrid.

" Very hard and heavy ; weight 50–62 pounds per cu. foot, oven-dry ; of very fine and uniform texture ; rather difficult to work because of its hardness, but finishing very smoothly and taking a natural waxy polish ; is very durable.

" According to Scott [South African Journ. Sci. xxiv. 313 : 1927] the 'solution in water is pale green'; wood burns well and easily, leaving a pure white ash and exuding a sticky treacle-like substance.

" *Gross Anatomy.* Growth rings poorly defined ; the darker bands which suggest growth rings are independent of seasonal variations. Pores very small and indistinct, fairly numerous but not crowded, arranged in short radial rows of two to five, mostly filled with dark gummy deposits. Vessel lines very fine, but distinct. Rays minute, barely visible with a hand lens on cross and tangential sections, low and inconspicuous on the radial...............

" *Minute Anatomy.* Growth rings defined by slight difference in density. Pores thick-walled, sub-circular or radially flattened, arranged in rows of two to several pores each, sometimes appearing sub-divided ; vessel perforations simple ; pits numerous, fairly large, the appertures elongated ; dark red masses of gum abundant. Parenchyma in fairly numerous, uniseriate, irregular and broken tangential lines ; dark infiltrates common. Rays 7–25 cells deep and 1 or 2 cells wide, mostly uniseriate ; somewhat heterogeneous, the larger cells usually marginal ; dark infiltrates common ; pits into vessels of same appearance as those between vessels. Wood fibres very slender, thick-walled, indistinctly pitted, arranged in definite radial rows. Most of the elements of the wood contain oil globules."

The structure described above agrees closely with that seen in the specimens available for comparison. However, exception must be taken to the suggestion of Scott that " the solution in water is pale green." Whether this is true when the wood is fresh I am not in a position to say, but repeated experiments with the available material failed to give a positive result. In fact a means of distinguishing *E. africana* from *Cinnamosma fragrans* was found to be that an aqueous infusion of the former was colourless, whereas that of the latter gave a yellowish-green, fluorescent liquor.

LOCAL AND TRADE NAMES (chiefly from Burtt-Davy's paper).

" Tomboti," " um Tomboti," " Sandalwood," " Sandalo," " Helengomaash " or " Shelinga maash," " Muconite," " faux bois d'aigle," " faux bois de calambac," " faux bois de calambounc," " adlerholz," " agelhout," " agalloche," "bois d'agalloche," " Pao d'aquilla," " calambac."

MATERIAL EXAMINED.

(1) " Tamboti Wood." Transvaal. J. Burtt-Davy, 52–1920.
(2) " Tambotie-boom." Transvaal. J. Burtt-Davy, 86–1906.
(3) Portuguese East Africa. J. Gardner and Sons, 1916.
(4) " Ntomboti." Swaziland. Brit. Emp. Exhib. 120–1924.
(5) " African Green Sandalwood." J. Heathcote, 14–1886.
(6) " Muconti." Livingstone, 1860.
(7) " Mukunti." E. Africa. Kirk, 1864.

Excoecaria Agallocha *L.* (Euphorbiaceae).

According to Heyne (6) this tree grows on the south-east coast of Asia and in tropical Australia. In certain unfavourable circumstances, as for instance when trees are growing in situations where they are liable to be splashed by sea water or scorched by the sun, a resinous deposit is formed in the wood. The resinous parts of the wood have been used from an early date as a substitute for those of *Aquilaria Agallocha*, and also as an adulterant in samples of other scented woods. An oil, which is used to cure skin diseases, is distilled from the wood.

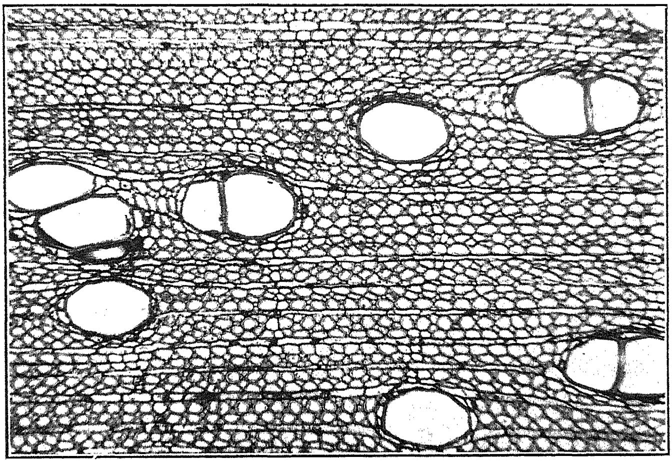
Bentham and Hooker (Gen. Plant. iii. 337) confused *Excoecaria Agallocha* L. with the African species *E. africana* Muell. Arg. This was an error which may well have led to the wood of both species being confused. However the position was made worse when, presumably on account of their strong superficial resemblance, the wood of *Cinnamosma fragrans* Baill. was mistaken for that of *Excoecaria africana*. The wood of *Excoecaria Agallocha* has thus been confused not only with that of *Aquilaria Agallocha* Roxb. because of its use as a substitute for that species, but also with that of *Excoecaria africana* as a result of a wrong identification. Actually there is no apparent reason why the wood of the two species of *Excoecaria* here described should be confused, as their general appearance is quite different when they are seen together. Thus, whereas the wood of the African species is very hard and dark in colour, that of *E. Agallocha* is very soft, white and spongy.

WOOD STRUCTURE (with special emphasis on the differences from *E. africana*).

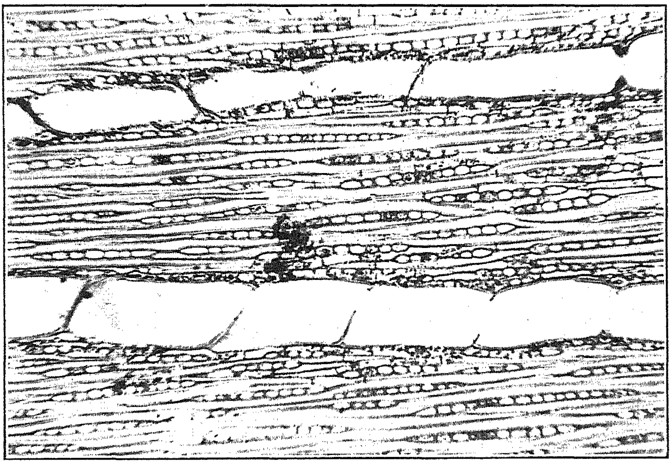
The wood differs from that of *E. africana* in having no dark-coloured heartwood, and in being very soft and spongy. Pores clearly visible with a lens, in short radial chains as in *E. africana*, but differing in not being filled with gummy deposits. The fine rays and parenchyma both just visible with a hand lens.

Growth rings absent. General arrangement and shape of pores similar to those of *E. africana*. The two species agree in having vessels with simple perforations, short segments, and numerous fairly large bordered pits with slit-like apertures. On the other hand no red deposits were noted in the vessels. Parenchyma arranged in tangential lines as in *E. africana*, but (at least in one specimen) less abundant. Darkly staining deposits present in a

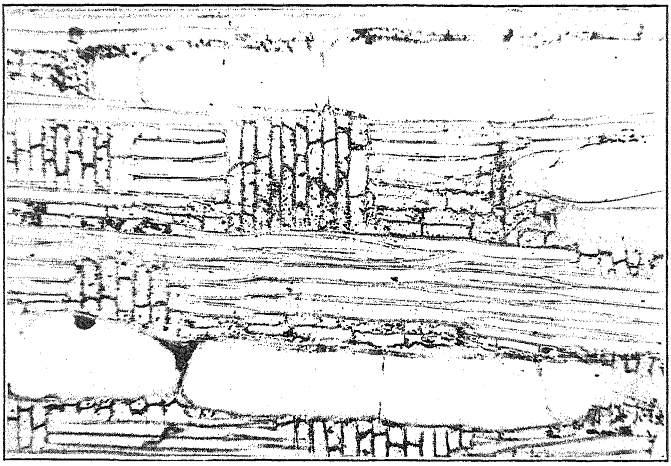
PLATE II



4. *Gonystylus bancanus* (Miq.) Baill. Buitenzorg. Dr. Scheffer. Transverse section. ×72.



5. *Gonystylus bancanus.* Tangential section. ×72.



6. *Gonystylus bancanus.* Radial section. ×72.

few of the parenchyma cells. Rays almost exclusively uniseriate, but a few partly biseriate, 1–20 (mostly 3–10, seldom exceeding 15) cells high, somewhat heterogeneous, very rarely with dark infiltrates in the cells; solitary crystals present in many cells. Wood fibres (tracheids) very different from those of *E. africana*, the walls being scarcely thickened, with small, crossed bordered pits.

MATERIAL EXAMINED.

(1) Hong Kong. C. Ford, 61–1884. (2) Sundarbans, Bengal. Indian Forestry Department, 1878 (this specimen was at one time examined by J. S. Gamble).

Euphorbia antiquorum *L.* (Euphorbiaceae). Fig. 3.

The wood of this species is sometimes sold in the East under local names which have led to its being confused with other scented woods described in this paper. A description of it is therefore given. The material available for study was very cross grained, so that it was found difficult to make out some of the characters, for which reason the description which follows is rather incomplete. Specimens of this wood received from Bangkok were chiefly in the form of irregular-shaped pieces similar to the resin-containing portions extracted from *Aquilaria Agallocha.* Very little definite information concerning the uses of this wood has been found, but there seems no doubt from the information supplied by Dr. Kerr that it is used, at all events to some extent, as a substitute for the more valuable scented woods.

WOOD STRUCTURE.

Wood light, colour yellowish-brown or darker, no differentiation into heart and sap wood, although more darkly coloured patches occurred sporadically. Pores very infrequent, scarcely visible with a lens. Rays densely crowded, likewise indistinct with a lens. With a microscope the pores were seen to be mostly solitary, but sometimes in radially-arranged groups of two or three, rounded or angular; sometimes the radial diameter was greater than the tangential. Maximum diameters observed 64µ by 54µ (mostly about 53µ by 37µ). Walls of vessels moderately thick, thickening and perforations scalariform. Vessels often filled with darkly staining contents. Parenchyma paratracheal, but also diffuse. Fibres (tracheids) with wide lumina, in places completely plugged with a substance that stained readily with safranin. Bordered pits minute. Rays chiefly uniseriate or locally biseriate for a part of their height, usually heterogeneous, 1–10 (mostly 1–4) cells high. The nature of the ground tissue seemed to vary in the different samples of material available. In some it was composed of fibres as described above, whilst in other samples it was softer, the lumina of the cells were wide, and they were definitely of the nature of tracheids. The frequency in the occurrence of partially biseriate rays also varied, as did the shape of the individual cells composing them. In the light of these variations it seems possible that more than one species of *Euphorbia* is concerned, but until further material is available it is impossible to settle this point.

TRADE AND LOCAL NAMES.

" Kalamet," " Kalampak," " Galat dai," " Da-look."

MATERIAL EXAMINED.

(1) " Kalampak," " Galat dai." Bangkok, 29–1929. (2) " Da-look." Ceylon. S. Jayeteleki. (3) Specimen from a tree destroyed by a cyclone in Calcutta Botanic Garden, 1864.

Gonystylus bancanus (*Miq.*) *Baill.—Gonystylus Miquelianus* T. et B. (Thymelaeaceae). Figs. 4–6.

Moeller (l.c.) records that the wood of *Gonystylus Miquelianus* T. and B. has been used as a substitute for that of *Aquilaria* sp. This is also confirmed by Heyne (6) who states that the " gara " wood sold in Java is usually that of *Gonystylus bancanus* Baill. The tree, according to Heyne, is a giant of the forest, being up to 145 ft. high and 3 ft. thick. It appears that under certain conditions the wood becomes filled with resin in much the same way as that of *Aquilaria* spp. The scented portions of the wood are stated to be bright yellow and soft, and to taste like caramels, but with a bitter after-taste. The portions of the wood containing the resin are extracted from felled trees and also from fallen trees that are lying about. The normal wood is used in the manufacture of walking sticks, small boxes, etc. In the present investigation only normal wood was available for study.

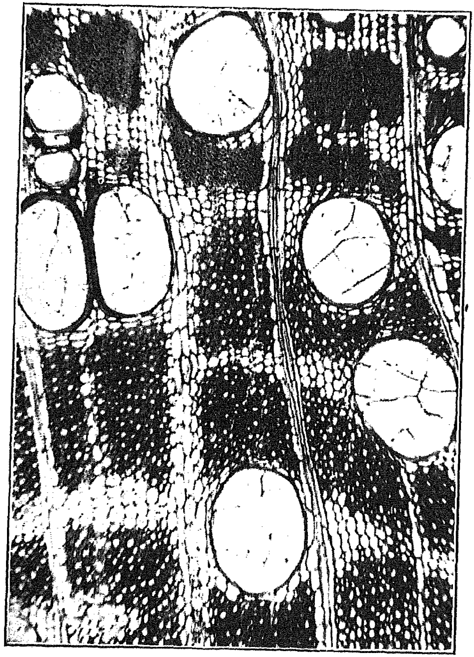
WOOD STRUCTURE.

Wood yellow with greyish streaks and patches, moderately hard. Pores clearly visible with the naked eye, fairly uniformly distributed, but with a tendency to be in concentric zones. Ripple marks very clear on tangential surfaces.

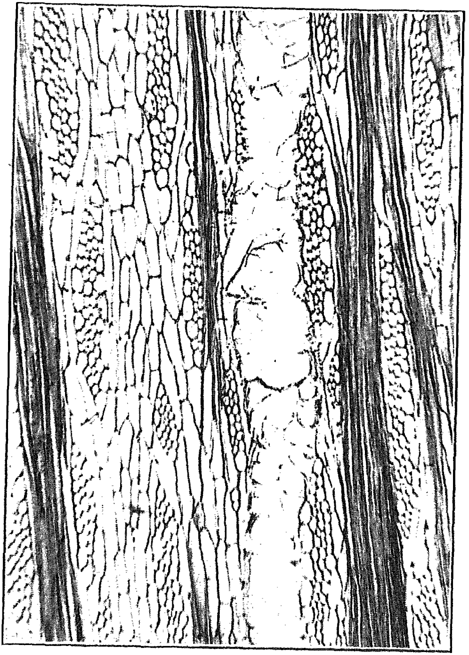
Brief notes on the microscopical anatomy are given by Moeller (l.c.). His description, which agrees very closely with what I have observed, is here repeated and extended to include certain other characters made more obvious by the use of microtome preparations.

The groundwork of the wood is made up of tracheids, with slit-like bordered pits, scattered throughout which there are fairly numerous pores, sometimes solitary, but chiefly in short radial series, with vessel walls flattened where they are in contact with one another, predominantly 120µ in diameter in both directions, but sometimes smaller than this, or reaching 172µ by 120µ. Vessel perforations simple. Inter-vascular pits minute or slit-like. Parenchyma not very frequent, chiefly in short, broken, tangential bands, also circumvasal. Rays predominantly uniseriate, but sometimes also partly or wholly biseriate, 1–30 (mostly 5–15) cells high, heterogeneous; solitary crystals frequently present in ray cells.

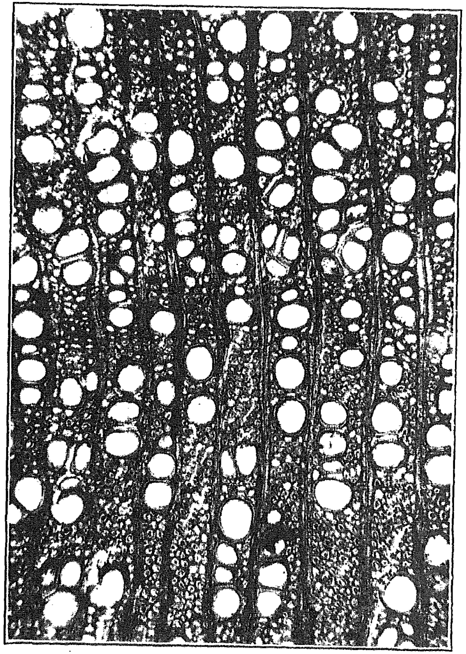
PLATE III



7. *Cordia fragrantissima* Kurz. Burma. Indian Forestry Dept., 1878. Transverse section. ×72.



8. *Cordia fragrantissima.* Tangential section. ×72.



9. *Mansonia Gagei* J. R. Drumm. J. S. Gamble. Rangoon. 12-1902. Transverse section. ×90.

LOCAL NAMES.

" Gara," " Kajoe garoe."

MATERIAL EXAMINED.

(1) Buitenzorg, Java. Dr. Scheffer. (2) Philippines. Imperial Forestry Institute 1788.

Cordia fragrantissima *Kurz.* (Boraginaceae). Figs. 7 and 8.

According to Gamble (4) this tree occurs chiefly in the hills of Martaban and Tenasserim, and in Upper Burma. It is stated to be deciduous, and it has been suggested that the wood should be more widely used on account of its handsome grain and fragrant smell. It is on account of its scent that the wood has been included in the present paper. Also it has been confused with the wood of some of the other species here described on account of the similarity of some of their local names. It is used as a cosmetic by Burmese women. Mr. Burkill informs me that it is regarded as a superior wood to *Mansonia Gagei* for this purpose, the latter being a substitute for it used chiefly by people of a lower social standing. Only one specimen was available for examination in the Kew collections. This had the local name of " Toungkalamet," and was received from Burma through the Indian Forestry Department in 1878.

WOOD STRUCTURE.

The gross features in the one specimen available agreed with the following description given by Gamble : " Wood moderately hard, reddish-brown with darker streaks, beautifully mottled. Pores moderate sized to large, in roundish patches, which are joined by occasional, broken concentric lines. Medullary rays rather distant, moderately broad, with a well-marked and rather handsome silver grain."

Groundwork of wood made up of fibres, mostly with a narrow lumen, and abundant terminal parenchyma. The latter is arranged in broad concentric bands, broken here and there, but elsewhere with a tendency to coalesce. The width of the parenchyma bands varied throughout their length (as shown in transverse sections), but they usually broadened out near the vessels, so that the latter were in most instances entirely surrounded by (circumvasal) parenchyma. The vessels were relatively large in diameter, 20μ–260μ (mostly 200–220μ), roughly circular, solitary (sometimes solitary ones were quite close together) or in groups of two or rarely more, the groups being roughly circular in outline. Nearly all the vessels were filled with tyloses. Pits in vessels small, bordered, fairly close together. Rays markedly heterogeneous, 1–6 (mostly 3–5) cells wide and 1–40 (mostly 17–27) cells high. A few solitary crystals were sometimes present in the medullary rays cells.

LOCAL NAMES.

" Kalamet," " Toungkalamet."

MATERIAL EXAMINED.

"Toungkalamet." Burma. Indian Forestry Department, 1878.

Mansonia Gagei *J. R. Drumm.* (Sterculiaceae). Figs. 9 and 10.

The wood of *Mansonia Gagei*, as stated above, is used in Burma as a substitute for the more valuable *Cordia fragrantissima*, which is used as a cosmetic. In a recent article Chowdhury (3) states that it is used as a substitute for true Sandalwood (*Santalum album*) but without stating for what purpose.

A description of the wood given by Gamble (5) has been repeated with minor alterations by Record (10). Another description of it has been given by Chowdhury (l.c.). The chief disagreement in these descriptions concerns the scent of the wood. Record states that the wood has no scent, whilst Chowdhury says that it is scented but less strongly than *Santalum album*. I have examined a number of specimens with apparently identical structure, but which vary in the extent to which they are scented, those that have been in the Kew collection only a comparatively short time being, as a rule, more strongly scented than specimens which have been there longer. Mr. Burkill informs me that when freshly felled the wood is not scented, but that the scent develops whilst the trees are decaying in the forest. A brief anatomical description is given here for the sake of completeness.

WOOD STRUCTURE.

Growth rings visible, but poorly defined. Pores small, indistinct under a lens. Rays minute, numerous. Pronounced ripple marks present.

Pores thick-walled, sub-circular, mostly in radial rows. Diameter 40μ. Vessel perforations simple. Intervascular pits minute. Parenchyma in numerous, short, irregular, uniseriate lines. Rays mostly biseriate, a few uniseriate, mostly 16 cells high; heterogeneous. Wood fibres thick-walled, pits small, inconspicuously bordered.

TRADE NAMES.

"Sandalwood," "Mai chan," "Kalamet," "Chanchamot."

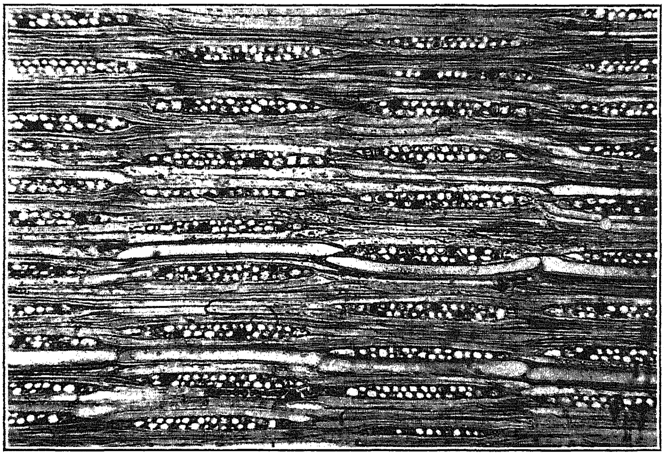
MATERIAL EXAMINED.

(1) "Kalamet." Tenasserim. J. S. Gamble, 22–1906. (2) "Kalamet." Rangoon. J. S. Gamble, 12–1902. (3) Mandalay. F. N. Howes, 1928. (4) "Sandalwood" or "Siamese sandalwood." Singapore. (5) "Chanchamot." Kohlak, Siam.

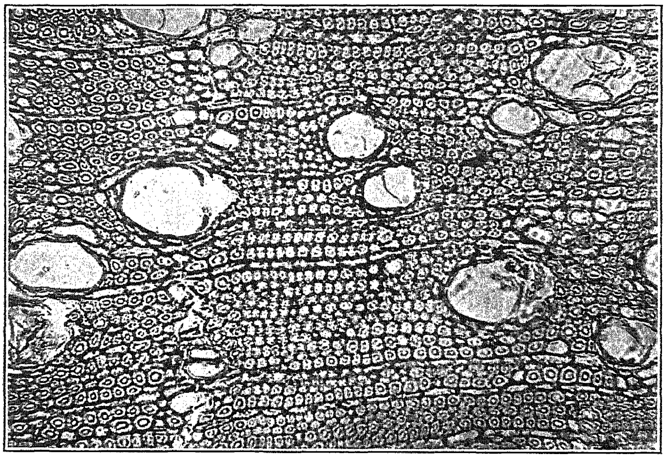
Cinnamosma fragrans *Baill.* (Canellaceae). Figs. 11 and 12.

This species could not have been described in the present paper had it not been for the kindness of Professor Record in supplying authentic material from the Yale collections. It was also due to Professor Record that my attention was drawn to the following notes in "Tropical Woods" (11): "Canellaceae.—Secretory cells have

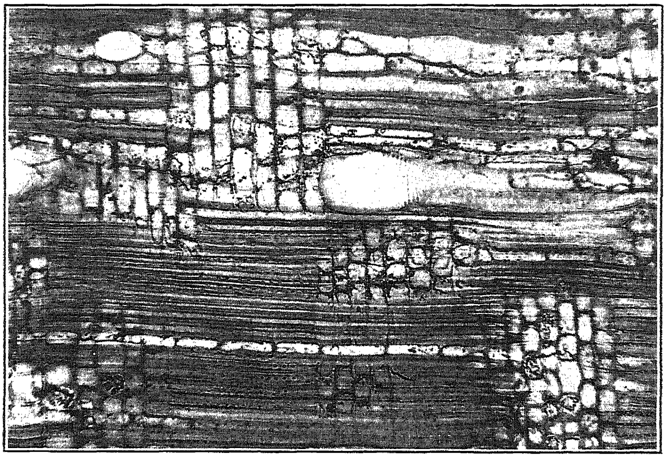
PLATE IV



10. *Mansonia Gagei.* Tangential section. ×90.



11. *Cinnamosma fragrans* Baill. Yale No. 7367. Transverse section. ×90.



12. *Cinnamosma fragrans.* Radial section. ×90.

been found in the parenchyma strands and in the rays of *Cinnamosma fragrans* Baill., wood specimens of which were supplied by the Governor General of Madagascar and Dependencies. . . . The vernacular name of the tree is given as 'Metrobeantina.' This wood agrees in all important details with the 'taggar wood' used by the Parsees of Bombay in religious ceremonies, judging from a specimen of this material supplied by Mr. Wilfred H. Schoff, secretary of the commercial museum of Philadelphia." The following remarks are also quoted in "Tropical Woods," l.c., from the "Report of the Museum of the Pharmaceutical Society of Great Britain," 1895–1902 (London, 1903, 42–45). "This dark wood is exported from the north of Madagascar (where the tree is known as 'hazo-mainty,' i.e. blackwood) to Zanzibar, whence it reaches Bombay. The vessels are usually isolated, their joints perforated in a scalariform manner, their walls have relatively large pits, and they are only sparingly surrounded with parenchyma fibres, which are either isolated, or form short transverse series between the fibre tracheids, which are thick-walled and furnished with large pits. Large oil cells, with yellow contents, are also present and the medullary rays consist of one or two rows of cells. The oil cells and scalariform vessels indicate that it is probably derived from a Lauraceous tree." The article in "Tropical Woods" then continues "The last statement fails to take into account the fact that the wood fibres of the Lauraceae have simple pits, while those of the Canellaceae are abundantly pitted with distinctly bordered pits."

I found that the wood of this species agreed not only with the above-mentioned so-called Crotons from Madagascar, etc., in the Kew collections, but also with a sample of "Calambac" sent from Kalantan, where it was bought in the market by a former hospital assistant of Dr. Gimlette. It is of interest that this wood from Madagascar is exported not only to Bombay but also reaches Kalantan. Mr. Burkill says there is evidence that it was traded in Siam as early as 1200 A.D., having been imported from the neighbourhood of Zanzibar.

A wood of unknown botanical identity was also described by Moeller in the paper on Aloes wood already mentioned (9), which, from the following description, seems clearly to be the same wood: "Taggar wood in Bombay, wie Aloëholz verwendet, über Madagaskar aus Zanzibar eingeführt.........Das Holz ist braun, an frischen Sägeflächen gelblich-grün, beinhart, gut spaltbar, geruchlos [!], beim Verbrennen eigenhümlich aromatisch. Der gefärbte Querschnitt lässt unter der Lupe die dicht gereihten Markstrahlen und zerstreute Pünktchen erkennen.

"Mikroskopischer Bau: Die Gefässe stehen zumeist einzeln, ihre Glieder sind leiterförmig perforirt, ihre Wand ist sehr dick und trägt relativ grosse Hoftüpfel. Sie sind von spärlichen Parenchymfasern begleitet. Solche finden sich auch vereinzelt oder in kurzen Querreihen zwischen den Fasertracheïden. Diese sind sehr derbwandig und tragen ungewöhnlich grosse Hoftüpfel. Schon am Querschnitte fallen einzelne Parenchymzellen durch ihre Grösse und den citronengelben Inhalt auf. Dieselben erweisen sich auf Längsschnitten als Oelzellen. Die Markstrahlen sind ein- oder zweireihig; sie führen oft grosse Einzelkrystalle."

It is also suggested in the paper from which the above quotation is reproduced that the wood belongs to a Lauraceous tree, which, as pointed out in the reference quoted from "Tropical Woods," fails to take into account the fact that the pits of the wood fibres are bordered, whereas those in the Lauraceae are simple.

WOOD STRUCTURE.

Wood hard and heavy. Colour varying in different specimens, but most material showing a strong superficial resemblance to *Excoecaria africana*. The specimen Yale No. 7367 lighter coloured than the others, but even this specimen almost black at the centre. Longitudinal surfaces with a distinctive yellow colour. Smell pleasant but faint, and always perceptible when the wood is boiled. An aqueous infusion of a few splinters in boiling water yellowish-green and fluorescent—a character distinguishing it from all the other species examined. Pores infrequent, mostly solitary but sometimes in pairs. Maximum diameters observed 100µ by 120µ, but mostly about 67µ by 88µ. Walls of vessels thick, with large pits. Perforations scalariform. Parenchyma circumvasal and diffuse, the latter isolated or with a tendency to be in short tangential lines. Fibres thick-walled, angular, with very pronounced bordered pits. A very characteristic feature was the large oil-cells, sometimes with yellow contents, which developed chiefly in the rays but sometimes in the parenchyma strands. Rays predominantly uniseriate, but sometimes partly or wholly biseriate, often with large crystals in the cells, up to 33 cells high.

LOCAL NAMES.

"Santal vert," "Vohilahitra," "Calambac," "Hazo-mainty," "Metrobeantina," "Taggar wood."

MATERIAL EXAMINED.

(1) S. J. Record, Yale 7367. (2) "Calambac" from the Market at Kalantan, 1931. (3) "Vohilahitra." Madagascar. G. F. Scott Elliot, 122–1891. (4) "Santal vert." Zanzibar. A very old specimen with no date received from the University of Louvain.

CONCLUDING REMARKS. In a note on "Kalamet" wood in the Bulletin of the Imperial Institute, 1906 (1), it is stated: "All that can be said at present is that there are recognised in Burma three kalamet woods, two native and one introduced. One of the Burmese plants is now known to be *Mansonia Gagei*; the sources of the other two kalamets have yet to be discovered."

It is hoped that the information collected together in the present paper may help to remove the obscurity that has for so long surrounded the botanical identity of these scented woods which are so highly prized in the East. Mr. Burkill is uncertain whether the Aloes wood mentioned in the Bible was the wood of *Aquilaria Agallocha* or the one that has been recognised in this paper as that of *Cinnamosma fragrans*. There is historical evidence that the wood of both species has been prized from ancient times. It is possible that the coastal trade from East Africa to the Levant may have been developed before the overland trade from India. If this is so the original Aloes wood was probably that of *Cinnamosma fragrans* imported from Zanzibar. The exact sequence by which the remaining woods came on the market is difficult to say, but it seems probable that *Aquilaria Agallocha* and *A. malaccensis* were the earliest species to be imported in the Far East. *Cinnamosma fragrans* probably also reached the East from Zanzibar at an early date. Later on, owing to the value of these woods and the difficulty in obtaining them, others came to be used as substitutes. Doubtless the practice of unscrupulous traders of selling inferior wares in place of more valuable ones accounts for the greater part of the confusion that has arisen.

The writer wishes to express his thanks to all who have assisted in this investigation, especially to Professor S. J. Record, Mr. J. H. Holland, Mr. I. H. Burkill, the Director of the Forest Products Research Laboratory, Princes Risborough, for figures 1-3 and 9-12, and to Mr. G. Atkinson for figures 4-8.

LITERATURE CITED.

1. *Bull. Imp. Inst. London*, iv. 67 (1906).
2. BURTT-DAVY in *Tropical Woods*, no. 17, 15 (1929).
3. CHOWDHURY in *Indian Forester*, lvii. 53 (1931).
4. GAMBLE, *A Manual of Indian Timbers*, London, 1902.
5. GAMBLE in *Journ. Linn. Soc. Bot.* xxxvii. 262 (1904).
6. HEYNE, *De Nuttige Planten van Nederlandsch Indie*, Batavia, 1927. (Information obtained chiefly from an unpublished English translation of the 1917 edition of this book.)
7. HOOPER in *Agricultural Ledger*, no. 1 (1904).
8. *Kew Bulletin*, 1888, 136.
9. MOELLER in *Pharmaceutische Post*, 1896, 1–40, and *ibid*, 1898, 1–28.
10. RECORD in *Tropical Woods*, no. 18, 53 (1929).
11. *Tropical Woods*, no. 1, 9 (1925).

IV.—ERAGROSTIS MAJOR AND E. MINOR.

T. A. SPRAGUE AND C. E. HUBBARD.

The names *Eragrostis major* and *E. minor* were proposed in 1809 by Host (Ic. Gram. Austr. iv. 14, 15) for *Briza Eragrostis* L. and *Poa Eragrostis* L. respectively. Host, however, did not in 1809 supply a diagnosis of his new genus *Eragrostis*, so that that name was not validly published by him. The valid publication of *Eragrostis* dates from 1812, when Palisot de Beauvois (Agrost. 70)—apparently quite independently—described a new genus, *Eragrostis* Beauv., basing it on *Poa Eragrostis* L., to which he gave the new name *Eragrostis poaeoides*. Beauvois also included seven other species in *Eragrostis*. He placed *Briza Eragrostis* L. in another new genus, *Megastachya*, based on *Poa mucronata* Beauv. Fl. Owar. i. 5, t. 4. The two genera *Eragrostis* Beauv. and *Megastachya* Beauv., were therefore roughly equivalent to *Eragrostis* Host., although *Megastachya* included species now assigned to other genera.

Host in 1827 (Fl. Austr. i. 135) gave a generic description of his *Eragrostis*, still including in it the two species *E. major* (*Briza Eragrostis*) and *E. minor* (*Poa Eragrostis*). *Eragrostis* Beauv., as so circumscribed, was accepted by Reichenbach (Consp. 54 : 1828), who recognized two Sections, *Eragrostis* (Beauv. sensu stricto), and *Megastachya* (Beauv.).

The nomenclatural status of the two binary combinations, *Eragrostis major* Host, and *E. minor* Host, now remains to be considered. These names were accepted for many years for the two species concerned. The question at once arises whether these names were validly published, since they appeared three years before a description of the genus *Eragrostis* was supplied by Beauvois. If they had been *new* species, their descriptions would have validated the *specific epithets*, as in the case of *Villebrunnea integrifolia* Gaud. and *V. crenulata* Gaud. (Voy. Bonite, Bot., Atlas, tt. 91, 92) ; the epithets *integrifolia* and *crenulata* are treated as having been validated by the accompanying plates with dissections, although the *generic* name *Villebrunnea* is not validated by these two plates. *Eragrostis major* and *E. minor*, on the other hand, were merely new names for the old species *Briza Eragrostis* and *Poa Eragrostis*. The only justification for changing the latter names was the transference of the species to a new genus *Eragrostis*, in which the retention of the specific epithet " *Eragrostis* " would have resulted in each case in the creation of the tautonym "*Eragrostis Eragrostis*." Until the *generic* name *Eragrostis* was validly published, however, such changes were inadmissible, and the names *Eragrostis major* Host (1809) and *E. minor* Host (1809) are therefore, in the writers' opinion, illegitimate.

The earliest specific epithet available under *Eragrostis* for *Briza Eragrostis* L. is *cilianensis* (*Poa cilianensis* All., 1785) ; and the earliest name available under *Eragrostis* for *Poa Eragrostis* L. is *Eragrostis poaeoides* Beauv. (1812).

The principal relevant references to the genus and to the two species concerned are given below.

Eragrostis *Beauv.* Agrost. 70, 162 (1812), emend. Reichb. Consp. 54, n. 1031 (1828), excl. spec. nonnull. *Eragrostis* Host, Ic. Gram. Austr. iv. 14, 15 (1809), sine descr. gener. ; Host, Fl. Austr. i. 135 (1827), descr. *Megastachya* Beauv. Agrost. 74, 167 (1812), partim.

Eragrostis cilianensis (*All.*) *Vignolo-Lutati* in Malpighia, xviii. 386 (1904); F. T. Hubbard in Philipp. Journ. Sci. viii. Bot. 159 (1913). *Briza Eragrostis* L. Sp. Pl. ed. 1, 70 (1753). *Poa cilianensis* All. Fl. Pedem. ii. 246, t. 91, f. 2 (1785). *Briza oblonga* Moench, Meth. Pl. 185 (1794). *Poa megastachya* Koel. Descr. Gram. 181 (1802). *P. Eragrostis* (L.) Brot. Fl. Lusit. i. 103 (1804). *Eragrostis major* Host, Gram. Austr. iv. 14, t. 24 (1809). *Megastachya oblonga* (Moench) Beauv. l.c. *Poa oblonga* (Moench) Baumg. Enum. Stirp. Transs. iii. 238 (1816). *Briza megastachya* (Koel.) Hort. ex Roem. et Schult. Syst. Veg. ii. 585 (1817), in syn. *Megastachya Eragrostis* (L.) Roem. et Schult. l.c. 575, 584. *Poa flexuosa* Roxb. Fl. Ind. i. 340 (1820). *P. Roxburghiana* Schult. Mant. Syst. Veg. ii. 314 (1824). *P. tortuosa* Spreng. Syst. Veg. i. 345 (1825). *Eragrostis megastachya* (Koel.) Link, Hort. Berol. i. 187 (1827). *Poa cachetica* Schumacher, Beskr. Guin. Pl. 66 (1827). *Eragrostis vulgaris* var. *megastachya* (Koel.) Coss. et Germ. Fl. Env. Paris, 641 (1845). *E. flexuosa* (Roxb.) Steud. Syn. Pl. Glum. i. 266 (1854). *E. poaeoides* var. *megastachya* (Koel.) A. Gray, Man. Bot. North. Unit. States, ed. 2, 563 (1856). *E. minor* var. *major* (Host) Beck, Fl. Nied.-Öst. i. 88 (1890). *E. Eragrostis* (L.) MacMill. Metasperm. Minnesota Vall. 75 (1892). *E. megastachya* β *cilianensis* (All.) Aschers. et Graebn. Syn. Mitteleur. Fl. ii. Abh. i. 371 (1900). *E. minor* var. *megastachya* (Koel.) Burtt-Davy in Jepson, Fl. West. Midd. Calif. 60 (1901). *E. costata* F. Turner in Proc. Linn. Soc. N.S. Wales, xxx. 91 (1905). *E. vulgaris* subsp. *E. major* (Host) Rouy, Fl. France, xiv. 262 (1913). *E. articulata* De Wild. in Bull. Jard. Bot. Brux. vi. 58, t. 2 (1919). *E. Starosselskyi* Grossheim in Not. Syst. Herb. Hort. Bot. Petrop. iv. 18 (1923). *E. Schweinfurthiana* Jedwabnick in Mez, Bot. Archiv. v. 194 (1924).

Distrib. Mediterranean region, Tropical and South Africa, India. Now introduced and abundantly naturalized in America, Australia and elsewhere.

Eragrostis poaeoides *Beauv.* Agrost. 162 (1812). *Poa Eragrostis* Linn. Sp. Pl. ed. 1, 68 (1753). *Eragrostis minor* Host, Gram. Austr. iv. 15 (1809). *E. Eragrostis* (L.) Beauv. Agrost., Explic. Planch. 10, t. 14, fig. 11 (1812). *E. poaeformis* Link, Hort. Berol. i. 188 (1827). *E. vulgaris* var. *microstachya* Coss. et Germ. Fl. Env. Paris, 641 (1845). *E. megastachya* subsp. *poaeoides* (Beauv.) Husnot, Gram. France, Belg. 55 (1898). *E. minor* var. *typica* Beck, Fl. Nied.-Öst. i. 88 (1890). *E. vulgaris* subsp. *E. minor* (Host) Rouy, Fl. France, xiv. 263 (1913).

Distrib. Mediterranean region, Tropical Africa, India, N. Asia. Introduced and naturalized in many parts of the world, but not so commonly as *E. cilianensis*.

The name *Eragrostis multiflora* (Forsk.) Aschers. Fl. Prov. Brandenb. i. 841 (1864), in obs., non Trin. (1830) (*Poa multiflora*

Forsk. Fl. Aegypt.-Arab. 21 : 1775) is often cited as a synonym of *Eragrostis cilianensis* (All.) Vignolo-Lutati, and has occasionally been used for that species. A recent examination of the type, however, shows it to be a distinct species, closely allied to *Eragrostis chalcantha* Trin. It appears to be confined to south-west Arabia (Yemen).

Megastachya brizoides Beauv., which according to Niles and Chase (Contrib. U.S. Nat. Herb. xxiv. 182: 1925) was "probably meant for change of name of *Briza Eragrostis* L.," was a new combination for *Poa brizoides* Linn. f. (1781). In the index to Beauv. Agrost. (p. 174) the following entry occurs: "Poa Brizoïdes *Lin. Vid.* MEGASTACHYA." This seems conclusive. In the Index Kewensis *Poa brizoides* Linn. f. was correctly reduced to *Eragrostis brizoides* Nees.

The validity of the generic name *Eragrostis* Host (1809) and of the binary combinations *E. major* Host and *E. minor* Host has been investigated in response to a request from Dr. M. L. Fernald. The conclusions reached are put forward for the consideration of botanists, and in particular of the Executive Committee of Nomenclature, with a view to obtaining, if necessary, a ruling on this and similar cases. If the views outlined above are upheld, it seems desirable, in order to avoid misunderstanding in the future, that the principles on which they are based should be explicitly stated in the International Rules. They may be formulated as follows :

(1) If a generic name has not been validly published, the publication of *new combinations*, or of *new names* based on older ones, under that generic name, is not recognized as valid for purposes of priority. After valid publication of the generic name, such new combinations, if required under the Rules, must be made again.

(2) Names of *new species* published with descriptions under a generic name which has not been validly published, are recognized as validly published for purposes of priority of their specific epithets.

V.—CONTRIBUTIONS TO THE FLORA OF SIAM.*— ADDITAMENTUM XXXVIII.

Lasianthus aristatus *Craib* [Rubiaceae-Psychotrieae] ; inter species ramulis pilis longiusculis haud adpressis instructis, foliis basi haud cordatis et supra nisi ad costam glabris, et inflorescentia sessili ob nervos laterales utrinque 7 adscendentes et foliorum paginae inferioris indumentum haud adpressum distinguendus.

Frutex circa 1 m. altus (ex *Kerr*) ; ramuli primo compressi, subhirsuti, mox teretes, sparse hirsuti, olivacei vel fusco-olivacei, circa 3 mm. diametro. *Folia* oblonga vel suboblonga, apice acute acuminata, basi rotundata, saepissime parum obliqua, 8–12 cm. longa, 3·3–4·8 cm. lata, rigide chartacea, sicca viridia vel fuscescentia,

---

*Continued from *K.B.* 1932, 486.

subtus pallidiora, supra ad costam parcius hirsuta, aliter glabra, subtus ad costam nervosque laterales pilis divergentibus hirsuta et aliter brevius subhirsuta, nervis lateralibus utrinque 7 oblique adscendentibus cum costa supra conspicuis subtus prominentibus, nervis transversis inter se parallelis et approximatis supra plus minusve conspicuis subtus subprominulis, longius ciliata, petiolo ad 4 mm. longo dense subadpresse hirsuto suffulta ; stipulae ad 5 mm. longae, dorso adpresse hirsutae, longe ciliatae. *Inflorescentia* axillaris, sessilis ; bracteae 4 mm. longae, dorso hirsutae, ciliatae ; flores albi (ex *Kerr*). *Receptaculum* breve, atrum, sparse hirsutum. *Calycis* tubus 1 mm. longus, segmenta 5, inter se inaequalia, lanceolata vel deltoideo-lanceolata, circa 3 mm. longa, basi 1–1·75 mm. lata, dorso hirsuta, intra glabra, ciliata. *Corolla* extra basi excepta hirsuta ; tubus 6·5 mm. longus, intra apice villosus ; lobi 5, circa 4 mm. longi et 2 mm. lati, apiculati, supra villosi. *Filamenta* 1·5 mm. longa, ad corollae tubi apicem adfixa, glabra, antheris subaequilonga. *Ovarium* 5–6-loculare.

Krat, Kao Saming, under 50 m., edge of evergreen forest, *Kerr* 17,914.

Lasianthus bicolor *Craib* [Rubiaceae-Psychotrieae] ; a *L. longipedunculato* Parker ramulis et foliorum pagina inferiore haud glabris, pedunculo communi breviore, a *L. puberulo* Craib ramulis et foliorum pagina inferiore plus minusve pilosis haud puberulis distinguendus.

Frutex circa 0·5 m. altus (ex *Kerr*) ; ramuli sparse pilosi, mox teretes, cortice pallide viridi obtecti, lenticellis parvis. *Folia* oblongo-elliptica, apice acute acuminata, basi rotundata vel cuneata, saepe inaequilateralia, 10–12 cm. longa, 3·5–4·2 cm. lata, chartacea, sicca viridia, supra glabra, subtus praesertim ad nervos pilosa, costa supra conspicua subtus prominente, nervis lateralibus utrinque 8–9 supra impressis subtus prominentibus intra marginem anastomosantibus, nervis transversis inter se parallelis subtus prominulis, petiolo circa 2 mm. longo piloso suffulta ; stipulae late lanceolatae, 2 mm. longae, demum deciduae, dorso pilosae. *Pedunculi* axillares, 5–10 mm. longi, pilosi, pauciflori ; pedicelli breves. *Receptaculum* 1·5 mm. longum, glabrum. *Calyx* purpureus (ex *Kerr*) ; tubus brevis ; segmenta late lanceolata, 4 mm. longa, 1·5 mm. lata, pilis paucis instructa. *Corolla* alba (ex *Kerr*) ; tubus 4·5 mm. longus, extra pilis paucis adpressis instructus, intra parte dimidia inferiore glaber, superiore dense villosus ; lobi 4, circa 4 mm. longi et 1·5 mm. lati, extra pilis adpressis subsparse instructi, intra dense villosi. *Stamina* 4, filamentis brevibus ad corollae tubi apicem adfixis, antheris 2·5 mm. longis margine parce hirsutis. *Ovarium* 4-loculare, stigmatibus 4.

Mê Hawng Sawn, Doi Pêpo, 1000 m., evergreen forest, *Kerr* 6180.

Lasianthus brevidens *Craib* [Rubiaceae-Psychotrieae] ; a *L. Curtisii* King et Gamble foliis pro rata latioribus, calycis segmentis multo brevioribus recedens.

Frutex circa 1 m. altus (ex *Kerr*) ; ramuli pilis fulvis vel ferrugineis subadpressis dense tecti, circa 2 mm. diametro. *Folia* late elliptica, elliptico-rotundata, vel rarius ovata, apice acute acuminata, basi saepe parum inaequilateralia, late cuneata vel latere altero cuneata, altero rotundata, 5–7 cm. longa, 2·8–4 cm. lata, chartacea, sicca saepe brunnescentia, pagina superiore glabra, inferiore ad costam subadpresse hirsuta, aliter sparsius piloso-hirsuta, costa supra conspicua subtus prominente, nervis lateralibus utrinque 5–6 supra conspicuis subtus prominentibus arcuatis, nervis transversis inter se parallelis subtus prominulis, margine ciliolata, mox recurva, petiolo ad 5 mm. longo adpresse hirsuto suffulta ; stipulae lanceolato-deltoideae, circa 1 mm. longae, dorso adpresse hirsutae, diu persistentes. *Inflorescentia* axillaris, sessilis, bracteis inconspicuis, floribus albis (ex *Kerr*). *Receptaculum* breve, breviter hirsutum. *Calycis* tubus brevis, segmenta lanceolata, acuta, circa 1·25 mm. longa, extra longe hirsuta. *Corolla* extra hirsuta, tubo 6 mm. longo intra superne piloso, lobis 5 supra pilosis 3 mm. longis 1·75 mm. latis. *Antherae* 1·25 mm. longae. *Stylus* 6 mm. longus, glaber. *Fructus* subglobosus, 3 mm. diametro, parce adpresse hirsutus, calyce persistente coronatus.

Prachuap, Kao Luang, 700 m., evergreen forest, *Kerr* 10,833.

Lasianthus brevipes *Craib* [Rubiaceae-Psychotrieae] ; a *L. conspicuo* Ridl. pedunculo communi brevi evoluto, pedicellis receptaculo cum calyce longioribus recedit.

Frutex circa 1 m. altus (ex *Kerr*) ; ramuli glabri, primo compressi, sicco fusci, mox teretes, cortice subolivaceo obtecti. *Folia* elliptica, apice acute acuminata, basi cuneata vel rotundata, saepe inaequilateralia, ad 11·5 cm. longa et 4·8 cm. lata, chartacea, sicca plus minusve fuscescentia, subtus parum pallidiora, pagina utraque glabra, costa supra conspicua subtus prominente, nervis lateralibus utrinque 8–10 supra subprominulis subtus prominulis late arcuatis intra marginem anastomosantibus, paucis aliis tantum paulo tenuioribus additis, nervulis rete transverse elongatum pagina utraque conspicuum efficientibus, margine primo distanter ciliata, petiolo 5–8 mm. longo glabro supra canaliculato suffulta ; stipulae deltoideae, acutae, 1·5 mm. longae. *Inflorescentia* pedunculo communi circa 1 mm. longo apice parvi-bracteato suffulta ; pedicelli 2·5 mm. longi, subglabri ; flores albi (ex *Kerr*). *Receptaculum* 1 mm. longum, atrum, pilis paucis albis instructum. *Calyx* receptaculo paululo longior, parvi-denticulatus, extra pilis paucis albis instructus. *Corolla* extra superne puberula ; tubus 11 mm. longus ; lobi 4, supra pilosi.

Nakawn Sritamarat, Ban Natawn, under 50 m., by stream in evergreen forest, *Kerr* 15,641.

Lasianthus chartaceus *Craib* [Rubiaceae-Psychotrieae] ; a *L. stercorario* Blume, cui habitu subsimilis, stipulis multo minoribus recedit.

Ramuli graciles, fusci, cito teretes, dense adpresse puberuli. *Folia* anguste oblonga, oblonga, vel oblongo-oblanceolata, apice acute acuminata, basi oblique rotundata vel cuneato-rotundata, 8–12 cm. longa, 2·3–2·9 cm. lata, chartacea, sicca brunnea vel fusco-brunnea, subtus pallidiora, supra ad costam inconspicue pubescentia, mox puberula, aliter glabra, subtus ad costam nervosque puberula, costa supra conspicua subtus prominente, nervis lateralibus utrinque 12–14 supra conspicuis subtus prominulis, nervulis inter se sat distantibus subtus fere prominulis, petiolo 1–3 mm. longo densius breviter pubescente suffulta; stipulae deltoideae vel oblongo-deltoideae, circa 2 mm. longae, diutius persistentes. *Fructus* vix 5 mm. diametro, sicco ater, puberulus, calycis segmentis 4 deltoideis 0·75 mm. longis coronatus, 5-locularis.

Trang, Kao Kao, towards Kuan Tang, *Rabil* 267.

Lasianthus Foxworthyanus *Craib* [Rubiaceae-Psychotrieae]; a *L. Rabilii* Craib foliis parum tenuioribus paulo longius petiolatis subtus cinereo-viridibus, fructu minore recedens.

Frutex circa 3 m. altus (ex *Kiah*); ramuli pilis brevibus cinereis adpressis obtecti. *Folia* oblongo-lanceolata vel suboblonga, apice acuminata, summo apice aristata, basi cuneata, usque ad 16 cm. longa et 4·5 cm. lata, sicca supra viridia vel fusca, subtus saepissime cinereo-viridia, supra ad costae basem pilis paucis brevibus instructa, aliter glabra, subtus ad costam nervos nervulosque pilis adpressis pallidis et aliter pilis paucis inconspicuis instructa, costa supra impressa subtus prominente, nervis lateralibus utrinque 8–9 adscendentibus supra conspicuis subtus prominentibus, nervis transversis inter se parallelis et approximatis supra conspicuis vel subconspicuis subtus prominulis, petiolo ad 7 mm. longo adpresse pubescente supra canaliculato suffulta; stipulae sublineares, 5 mm. longae, dorso adpresse pubescentes. *Infructescentia* axillaris, sessilis. *Fructus* fere 5 mm. longus, sicco ater, parce puberulus, calycis segmentis brevibus dorso adpresse pubescentibus coronatus.

Bachaw, *Kiah* 24,312.

Lasianthus incomptus *Craib* [Rubiaceae-Psychotrieae]; a *L. Curtisii* King et Gamble foliis maioribus, calycis segmentis conspicue brevioribus recedit.

Frutex circa 1·5 m. altus (ex *Kerr*); ramuli pilis fulvo-ferrugineis subadpressis dense tecti, ad 3 mm. diametro. *Folia* oblongo-obovata, oblongo-elliptica vel rarius elliptica, apice acute acuminata, basi saepissime parum inaequilateralia, cuneata vel latere altero cuneata, altero rotundata, 7–12 cm. longa, 2·5–4·3 cm. lata, rigide chartacea, sicca viridia, subtus pallidiora, supra ad costae basem pilis paucis instructa, aliter glabra, subtus ad costam nervosque laterales indumento ei ramulorum simili instructa, aliter pilis brevioribus adpressis subsparse instructa, costa supra conspicua subtus prominente, nervis lateralibus utrinque 6–7 supra conspicuis subtus prominentibus, nervis transversis inter se parallelis et approximatis pagina utraque plus minusve conspicuis, margine longius sparse ciliata, petiolo 2–4 mm. longo dense adpresse pubescente suffulta; stipulae 3 mm. longae, dorso dense adpresse pubescentes. *Inflorescentia* axillaris, pauciflora, sessilis, bracteis inconspicuis, floribus albis (ex *Kerr*); alabastra hirsuta. *Receptaculum* breve, adpresse hirsutum. *Calycis* tubus brevis, segmenta 4–5, circa 1·5 mm. longa. *Corollae* tubus 4 mm. longus, intra superne pilosus, lobi 4–5, circa 2·5 mm. longi et 1 mm. lati, supra pilosi. *Stamina* 4–5, antheris 0·75 mm. longis. *Stylus* 5 mm. longus; loculi 4–5.

Chantabun, Kao Soi Dao, 800 m., evergreen forest, *Kerr* 9618.

Lasianthus lineolatus *Craib* [Rubiaceae-Psychotrieae]; a *L. Ridleyi* King et Gamble foliis supra lineolatis, nervis lateralibus magis numerosis recedens.

Frutex circa 1·5 m. altus (ex *Kerr*); ramuli primo compressi, dense tomentoso-hirsuti. *Folia* oblongo-elliptica vel oblongo-oblanceolata, apice acute acuminata, basi late cuneata vel rotundata, 8–13 cm. longa, 2·7–4·7 cm. lata, chartaceo-coriacea, sicca supra viridia, subtus brunnea, supra glabra, subtus ad costam nervosque densius subhirsuta, aliter sparsius hirsuta, costa supra conspicua vel subprominula subtus prominente, nervis lateralibus utrinque 11 adscendentibus supra conspicuis subtus prominentibus, nervis transversis inter se parallelis et approximatis supra plus minusve conspicuis subtus prominulis, nervulis subtus subconspicuis, margine recurva, petiolo ad 7 mm. longo indumento ei ramulorum simili obtecto suffulta; stipulae ad 7 mm. longae, dorso dense adpresse hirsutae. *Inflorescentia* axillaris, sessilis; bracteae conspicuae, angustae, exteriores ad 1·7 cm. longae, interiores circa 5 mm. longae, omnes hirsutae. *Receptaculum* breve, hirsutum. *Calycis* tubus brevis, segmenta 5, lanceolata, 3 mm. longa, 1·25 mm. lata, dorso hirsuta, longius ciliata. *Corolla* ante anthesin superne pilosa, tubo intra superne piloso. *Antherae* 1·5 mm. longae. *Stigmata* 5.

Surat, Kao Nawng, 1100–1200 m., evergreen forest, *Kerr* 13,284.

Lasianthus maculatus *Craib* [Rubiaceae-Psychotrieae]; a *L. chinense* (Champ.) Benth., cui facie subsimilis, petiolis brevioribus, stipulis longioribus facile distinguendus.

Frutex circa 1·5 m. altus (ex *Kerr*); ramuli subsparse brevius pilosi, primo compressi, mox teretes, ad 2·5 mm. diametro. *Folia* saepissime oblongo-oblanceolata, apice acute acuminata, basi cuneata vel latere altero cuneata, altero rotundato-cuneata, 8–13 cm. longa, 1·8–4 cm. lata, chartacea, sicca supra plus minusve fuscescentia, subtus brunnea, supra ad costam sparse crispatim puberula, aliter glabra, subtus ad costam nervosque laterales adpresse pubescentia, aliter pilis brevibus subadpressis instructa, costa supra prominula subtus prominente, nervis lateralibus utrinque circa 13 supra conspicuis subtus prominentibus, nervis transversis inter se parallelis et sat distantibus pagina utraque subprominulis, nervulis rete gracile pagina utraque subconspicuum formantibus, margine sparse longius ciliata, petiolo 2–4 mm. longo adpresse pubescente suffulta; stipulae saepe diu persistentes, ad 9 mm. longae, dorso hirsutae. *Inflorescentia* axillaris, sessilis, pauciflora, bracteis inconspicuis; alabastra extra breviter sparse hirsuta. *Receptaculum* adpresse pallide hirsutum. *Calycis* tubus brevis, segmenta vix 2 mm. longa, cum tubo extra adpresse hirsuta. *Fructus* albus (ex *Kerr*), sicco ater, ad 7 mm. longus, conspicue costatus, subglaber, calyce diu persistente coronatus, 4-locularis.

Kaw Chang, Klawng Mayom, 50 m., common in evergreen forest, *Kerr* 6817.

Lasianthus marginatus *Craib* [Rubiaceae-Psychotrieae]; *L. Helferi* Hook. f. habitu similis sed ramulis et foliorum pagina superiore haud glabris, foliis basi haud cuneatis recedit.

Frutex circa 2 m. altus (ex *Kerr*); ramuli primo compressi, subferrugineo-hirsuti, cortice demum fusco-rubro obtecti, lenticellis haud conspicuis, ad 4 mm. diametro. *Folia* oblonga vel oblongo-oblanceolata, acuminata, summo apice acuta, basi oblique rotundata, rarius latere altero late cuneata, ad 9 cm. longa et 2·8 cm. lata, coriaceo-chartacea, supra ad costam hirsuta, aliter glabra, subtus ad costam nervosque laterales adpresse hirsuta et ad nervulos parce hirsuta, costa supra conspicua subtus prominente, nervis lateralibus utrinque 10 supra conspicuis subtus prominentibus, nervis transversis inter se parallelis et approximatis pagina utraque parum prominulis, longius ciliata, petiolo circa 3 mm. longo dense adpresse hirsuto suffulta; stipulae lanceolatae, 8 mm. longae, persistentes, dorso adpresse hirsutae. *Inflorescentia* axillaris, pauciflora, sessilis, floribus albis (ex *Kerr*). *Receptaculum* 1 mm. longum, pilis paucis longiusculis instructum. *Calycis* tubus fere 2 mm. longus, extra pilis longiusculis sparse instructus, intra glaber, lobi inter se inaequales, tubo subaequilongi. *Corolla* extra parce hirsuta, tubo 6 mm. longo superne intra dense piloso, lobis 5 sublanceolatis 4 mm. longis ad 1·5 mm. latis inferne dense pilosis. *Filamenta* circa 2 mm. longa, ad corollae tubi apicem inserta, antheris 1·5 mm. longis ciliatis. *Ovarium* 5-loculare.

Chantabun, Makam, under 50 m., open evergreen forest, *Kerr* 9551.

Lasianthus penicillatus *Craib* [Rubiaceae-Psychotrieae]; a *L. pergamaceo* King et Gamble stipulis deltoideis inter alia distinguendus.

Frutex circa 1 m. altus (ex *Kerr*); ramuli glabri, iuveniles compressi, sicci subfusci, mox substraminei vel subolivacei, circa 3 mm. diametro. *Folia* oblongo-elliptica vel oblongo-oblanceolata, apice acuminata, basi cuneata vel late cuneata, 16–22 cm. longa, 5–6·5 cm. lata, chartacea, pagina utraque glabra, costa supra conspicua subtus prominente, nervis lateralibus utrinque 14–16 pagina utraque prominulis late arcuatis, nervulis rete laxum pagina utraque subconspicuum efficientibus, ciliata, petiolo ad 8 mm. longo glabro suffulta; stipulae deltoideae, circa 5 mm. longae, primo crassius parce ciliatae. *Inflorescentia* axillaris, sessilis, ebracteata, floribus albis (ex *Kerr*). *Receptaculum* glabrum, 1 mm. longum. *Calyx* 1·25 mm. longus, subtruncatus, apice pauci-hirsutus. *Corolla* apice pauci-pilosa, aliter extra glabra; tubus 5 mm. longus, intra apice pilosus; lobi 3, ad 3 mm. longi et 2 mm. lati, supra pilosi. *Stamina* exserta, filamentis 1·25 mm. longis ad corollae tubi apicem adfixis, antheris 1·75 mm. longis. *Stylus* ad corollae tubi apicem attingens, stigmatibus tribus.

Krabi, Tambon Kao Panom, 100 m., evergreen forest, *Kerr* 18,827.

Lasianthus puberulus *Craib* [Rubiaceae-Psychotrieae]; a *L. longipedunculato* Parker ramulis foliisque haud glabris, pedunculo communi multo breviore inter alia distinguendus.

Frutex sarmentosus, circa 3 m. altus (ex *Kerr*); ramuli adpresse puberuli, luteo-virides, lenticellis inconspicuis. *Folia* oblongo-elliptica, late lanceolata, vel ovato-lanceolata, apice subacuminata vel acuminata, costa excurrente primo longius apiculata, basi cuneata vel rotundata, haud rarius acuminata et inaequilateralia, 4·5–9·5 cm. longa, 1·5–3·5 cm. lata, rigide chartacea, sicca viridia, subtus parum pallidiora, supra glabra, subtus ad costam nervosque sparse subadpresse longius puberula, costa supra conspicua subtus prominente, nervis lateralibus utrinque 4–5 supra conspicuis subtus prominentibus supremis intra marginem longius prorsus directis, nervis transversis approximatis inter se parallelis pagina utraque plus minusve conspicuis, petiolo 5–7 mm. longo longius adpresse puberulo supra canaliculato suffulta; stipulae diu persistentes, paulo ultra 1 mm. longae. *Pedunculi* axillares, ad 1 cm. longi, indumento ei ramulorum simili tecti. *Fructus* 6 mm. diametro, longitudinaliter 5-sulcatus, sicco fuscus, parce adpresse puberulus, calycis segmentis linearibus 5 mm. longis coronatus.

Krat, Kao Kuap, 600 m., evergreen forest, *Kerr* 17,735.

Lasianthus Rabilii *Craib* [Rubiaceae-Psychotrieae]; a *L. Hookeri* C. B. Clarke ex Hook. f. foliis minoribus brevius acuminatis recedit.

Frutex ramulis pilis brevibus ferrugineis adpressis obtectis. *Folia* saepissime oblonga, oblongo-oblanceolata vel elliptico-oblanceolata, apice acuminata, summo apice aristata, basi inaequilateralia, latere altero cuneata, altero late cuneata vel rotundato-cuneata, rarissime subaequaliter cuneata, 7–13 cm. longa, 2·8–4·7 cm. lata, chartacea, sicca supra plus minusve fuscescentia, subtus viridia vel parum brunnescentia, supra glabra, subtus ad costam nervos nervulosque pilis pallidis adpressis vel plus minusve divergentibus subhirsuta, costa supra saepissime impressa subtus prominente, nervis lateralibus utrinque 6–7 supra conspicuis subtus prominentibus, nervis transversis inter se parallelis et approximatis supra interdum conspicuis subtus prominulis, petiolo ad 5 mm. longo indumento ei ramulorum simili obtecto supra canaliculato suffulta; stipulae circa 3 mm. longae, dorso adpresse hirsutae. *Infructescentia* axillaris, sessilis. *Fructus* circa 7 mm. longus, calyce persistente circa 1·5 mm. longo coronatus.

Trang, Kao Kao, edge of forest, *Rabil* 364.

Lasianthus sarmentosus *Craib* [Rubiaceae-Psychotrieae]; a *L. inconspicuo* Hook. f. foliis tenuioribus, petiolis brevioribus, floribus paucioribus, et calycis segmentis conspicue brevioribus recedit.

Frutex tenuis, ad 3 m. altus (ex *Kerr*); ramuli graciles, 1·5–3 mm. diametro, nodos versus puberuli, aliter glabri. *Folia* saepissime elliptica vel oblongo-elliptica, caudato-acuminata, summo apice acuta, basi late cuneata vel rotundata, saepe parum inaequilateralia, 5–8·5 cm. longa, 1·8–2·8 cm. lata, chartacea, sicca viridia, subtus pallidiora, supra glabra, subtus matura ad costam nervosque laterales puberula, aliter glabra, costa supra impressa subtus prominente, nervis lateralibus utrinque 4–5 arcuatis supra conspicuis subtus prominentibus, nervulis supra subconspicuis subtus conspicuis, primo ciliolata, petiolo 2–3 mm. longo puberulo supra canaliculato suffulta; stipulae 1 mm. longae, diu persistentes. *Inflorescentia* axillaris, sessilis, pauciflora, floribus albis (ex *Kerr*), bracteis inconspicuis. *Receptaculum* 0·5 mm. longum, glabrum. *Calycis* tubus 0·25 mm. longus, segmenta deltoidea, subacuta, 0·75 mm. longa. *Corollae* tubus 3·5 mm. longus, intra apice parce pilosus, lobi 4, oblongi, 3 mm. longi, 1·5 mm. lati, sparse longius ciliati. *Antherae* paulo exsertae, 1 mm. longae.

Chantabun, Kao Soi Dao, 500 m., evergreen forest, *Kerr* 9614.

Lasianthus saxorum *Craib* [Rubiaceae-Psychotrieae]; a *L. andamanico* Hook. f. eiusque affinioribus foliis multo minoribus facile distinguendus; *L. lucido* Blume habitu subsimilis sed ramulis haud glabris et calycis lobis multo brevioribus recedit.

Frutex parvus (ex *Kerr*); ramuli dense breviter adpresse subflavo-puberuli, graciles, ad 1·5 mm. diametro. *Folia* oblongo-elliptica, oblongo-lanceolata, vel oblongo-oblanceolata, apice caudato-acuminata, aristata, basi cuneata, saepe parum obliqua, ad 8·5 cm. longa et 2·3 cm. lata, rigida, supra glabra, subtus ad costam nervosque subadpresse pubescentia, ad nervulos pilis paucis instructa, costa supra conspicua subtus prominente, nervis lateralibus utrinque 5–6 supra conspicuis vel fere obscuris subtus prominentibus intra marginem adscendentibus, nervis transversis subtus prominulis, margine revoluta, petiolo ad 4 mm. longo indumento ei ramulorum simili tecto suffulta; stipulae deltoideae, 1·5 mm. longae. *Inflorescentia* axillaris, pauciflora, sessilis, floribus albis (ex *Kerr*), bracteis haud evolutis. *Receptaculum* breviter adpresse pubescens, circa 1 mm. longum. *Calycis* tubus 0·5 mm. longus, lobi deltoidei, tubo subaequilongi, cum tubo dorso breviter adpresse pubescentes. *Corolla* extra sparse adpresse albo-pubescens; tubus 3 mm. longus, intra superne pilosus; lobi 5, elliptici, acuminati, 2·5 mm. longi, 1·5 mm. lati, supra breviter pilosi. *Filamenta* 0·5 mm. longa, ad corollae tubi apicem adfixa, antheris subaequilonga. *Stylus* corollae tubo paululo longior; ovarium 5-loculare. *Fructus* 3·5 mm. diametro, fuscus, puberulus.

Lôi, Kao Krading, 1100 m., on rocks in light evergreen, *Kerr* 20,055.

Lasianthus scalaris *Craib* [Rubiaceae-Psychotrieae]; *L. Ridleyi* King et Gamble et *L. velutino* Ridl., subsimilis sed foliorum paginae inferioris pilis duriusculis et adpressis inter alia distinguendus.

Frutex circa 1 m. altus (ex *Kerr*); ramuli adpresse hirsuti, primo compressi, mox teretes. *Folia* elliptica, apice acute acuminata vel cuspidato-acuminata, basi parum inaequilateralia, late cuneata vel rotundata, 10–15 cm. longa, 4–7 cm. lata, rigide chartacea, sicca supra fusca vel viridia, subtus viridia, supra ad costae imam basem adpresse hirsuta, aliter glabra, subtus ad costam adpresse hirsuta, et ad nervos nervulosque brevius adpresse hirsuta, costa supra parum impressa subtus prominente, nervis lateralibus utrinque 7–9 supra conspicuis vel subprominulis subtus prominentibus arcuatis, nervis transversis inter se parallelis et approximatis supra subprominulis subtus prominulis, margine recurva, petiolo 10–17 mm. longo adpresse hirsuto supra canaliculato suffulta; stipulae circa 7 mm. longae et 4·5 mm. latae, dorso adpresse hirsutae. *Inflorescentia* axillaris, sessilis, conspicue bracteata, floribus albis (ex *Kerr*); bracteae ad 9 mm. longae, hirsutae. *Receptaculum* 1 mm. longum, parce hirsutum. *Calycis* tubus 0·75 mm. longus, segmenta 5, anguste deltoidea, 1 mm. longa, praecipue apice extra longe hirsuta. *Corolla* extra superne hirsuta, tubo fere 6 mm. longo intra apicem versus piloso, lobis 5 circa 2 mm. longis supra pilosis. *Stamina* 5, antheris 1·25 mm. longis filamentis brevibus.

Krabi, Tambon Kao Panom, 200 m., evergreen forest, *Kerr* 18,809.

Lasianthus setosus *Craib* [Rubiaceae-Psychotrieae]; a *L. Wallichii* (Wight et Arn.) Wight foliis supra haud glabris inter alia facile distinguendus.

Frutex circa 1 m. altus (ex *Kerr*); ramuli setis elongatis basi incrassatis subsparse instructi, olivacei vel straminei, circa 2 mm. diametro. *Folia* oblonga, apice acute acuminata, basi oblique truncata, cordatula, ad 8 cm. longa et 3 cm. lata, rigide chartacea, pagina utraque ad costam setis elongatis subsparsis et inferiore ad nervos laterales sparsis instructa, costa supra conspicua subtus prominente, nervis lateralibus utrinque 10 supra conspicuis subtus prominentibus intra marginem anastomosantibus inferioribus patulis, nervis transversis subtus saepissime prominulis, longius rigide ciliata, petiolo ad 2 mm. longo suffulta; stipulae deltoideae, 2·5 mm. longae, diutius persistentes, saepissime mox plus minusve reflexae, longe rigide ciliatae. *Fructus* parum compressus, 5 mm. longus, 7 mm. latus, ater, glaber, calyce persistente brevi coronatus.

Ranawng, Kao Talu, 50 m., evergreen forest, *Kerr* 11,827.

Lasianthus subaureus *Craib* [Rubiaceae-Psychotrieae]; a *L. andamanico* Hook. f. foliis stipulisque angustioribus, petiolo duplo longiore inter alia facile distinguendus.

Frutex ad 3 m. altus (ex *Kerr*); ramuli pilis brevibus adpressis primo subaureis obtecti, ad 3 mm. diametro. *Folia* oblongo-lanceolata, apice acute acuminata, basi conspicue parumve inaequilateralia, latere altero acuminata vel cuneata, altero cuneata vel rotundato-cuneata, usque ad 17 cm. longa et 3·7 cm. lata, subcoriacea, sicca supra nitida, saepissime parum lutescentia, subtus brunnescentia, supra ad costam basem versus tantum pilis paucis adpressis instructa, aliter glabra, subtus ad costam nervosque laterales pilis brevibus adpressis dense vel subdense instructa et ad nervulos puberula, costa supra conspicua vel parum impressa subtus prominente, nervis lateralibus utrinque 12 supra conspicuis subtus prominentibus costam prope arcuatis dein adscendentibus, nervulis rete laxum pagina utraque subprominulum efficientibus, margine recurva, petiolo ad 12 mm. longo pilis brevibus adpressis dense tecto supra canaliculato suffulta; stipulae diu persistentes, 2·5 mm. longae. *Inflorescentia* axillaris, pauciflora, floribus albis (ex *Kerr*), bracteis minutis. *Receptaculum* breve, pilis brevibus pallidis adpressis instructum. *Calycis* tubus circa 2 mm. longus, apice parvidenticulatus, extra pilis iis receptaculi similibus instructus. *Corolla* extra pubescens, tubo 12 mm. longo intra superne piloso, lobis 6 linearibus vel lineari-lanceolatis acutis circa 5 mm. longis et 1·75 mm. latis supra pilosis. *Filamenta* brevia, antheris 2·25 mm. longis paululo exsertis apice et basi pilis paucis instructis. *Stylus* 7 mm. longus, stigmatibus 6 angustis.

Adang, 400 m., evergreen forest, *Kerr* 14,117.

Lasianthus subcalvus *Craib* [Rubiaceae-Psychotrieae]; a *L. constricto* Wight ramulis foliisque glabris vel fere glabris, foliis maioribus recedens.

Frutex circa 1·5 m. altus (ex *Kerr*); ramuli glabri, iuventute sicci fusci, compressi, mox substraminei, teretes, circa 3·5 mm. diametro. *Folia* oblongo-elliptica, elliptica, vel lanceolato-ovata, apice acute acuminata, basi parum inaequilateralia, late cuneata vel latere altero late cuneata, altero rotundata, ad 23 cm. longa et 7·3 cm. lata, rigide chartacea, sicca subviridia, subtus pallidiora, glabra, costa supra prominula subtus prominente, nervis lateralibus utrinque 7–9 supra conspicuis subtus pallidis prominentibus, nervis transversis inter se parallelis supra plus minusve conspicuis subtus pallidis prominulis, petiolo 8–13 mm. longo suffulta; stipulae 1·5 mm. longae, dorso pubescentes. *Inflorescentia* axillaris, sessilis, bracteis inconspicuis; flores albi (ex *Kerr*). *Calycis* segmenta 4, circa 1 mm. longa. *Corollae* tubus 9 mm. longus, lobi 4, supra pilosi. *Fructus* fusiformis, sicco ater, 1·2 cm. longus, subglaber, calyce persistente coronatus.

Trang, Kao Soi Dao, 400 m., evergreen forest, *Kerr* 19,421.

Lasianthus virgatus *Craib* [Rubiaceae-Psychotrieae]; ab affini *L. glaberrimo* Ridl. ramulis haud glabris facile distinguendus.

Frutex circa 1·5 m. altus (ex *Kerr*); ramuli graciles, circa 2 mm. diametro, primo pilis brevibus sparse instructi, mox glabri, cortice fusco vel cinereo obtecti. *Folia* elliptica vel oblonga, apice caudato-acuminata, subacuta, basi cuneata vel late cuneata, haud rarius parum inaequilateralia, latere altero cuneata, altero late cuneata vel rotundata, circa 6·5 cm. longa et 2 cm. lata, sicca viridia vel parum fuscescentia, subtus pallidiora, pagina superiore glabra, inferiore ad costam pilis paucis instructa, demum fere glabra, costa supra impressa, subtus prominente, nervis lateralibus utrinque 8–9 pagina utraque prominulis intra marginem anastomosantibus, nonnullis aliis tantum paulo tenuioribus saepissime interiectis, nervulis rete laxum pagina utraque subprominulum efficientibus, praecipue apicem versus primo longius pauperius ciliata, petiolo circa 3 mm. longo parce pubescente supra canaliculato suffulta; stipulae 1 mm. longae, pauci-fimbriatae, dorso adpresse hirsutae. *Inflorescentia* axillaris, sessilis, bracteis minutis, floribus sessilibus. *Receptaculum* atrum, pilis paucis instructum, 1 mm. longum. *Calycis* segmenta 3–4, inter se aequalia vel inaequalia, ad 1·25 mm. longa, angusta, parce brunneo-hirsuta. *Corolla* extra apicem versus puberula, tubo 4 mm. longo intra apicem versus piloso, lobis 3 circa 1·75 mm. longis et 1·5 mm. latis supra pilosis. *Stamina* 3, filamentis antheris subaequilongis circa 0·5 mm. longis glabris ad corollae tubi apicem adfixis. *Discus* conspicuus. *Stylus* 6 mm. longus.

Trang, Kao Sung, 700 m., evergreen forest, *Kerr* 15,226.

Paederia hirsuta *Craib* [Rubiaceae-Paederieae]; foliis supra hirsutis vel hispidulis et receptaculo glabro *P. calycinae* Kurz similis sed foliis subtus molliter tomentosis, calycis segmentis pro longitudine latioribus recedit.

Caules lignosi, glabrescentes, sulcati. *Folia* matura rotundato-elliptica vel late oblonga, basi cordata, 9–14 cm. longa, 7–11·5 cm. lata, sicca subviridia, subtus pallidiora, sat rigida, supra hirsuta vel hispidula, subtus molliter tomentosa, costa supra conspicua subtus prominente, nervis lateralibus utrinque 6 supra conspicuis subtus prominulis, nervulis approximatis subtus conspicuis, petiolo usque ad 11·5 cm. longo suffulta; stipulae circa 5 mm. longae, deciduae vel subpersistentes. *Paniculae* axillares, infructescentes circa 8 cm. longae et 4 cm. latae, pedunculo rhachi et ramulis tomentellis. *Fructus* ambitu ovatus, compressus, stramineus, pyrenis atris pallide lineolatis circa 8 mm. longis et 6 mm. latis conspicue stramineo-marginatis.

Krabin, Bupram, 200 m., evergreen forest, *Kerr* 9824.

Paederia pallida *Craib* [Rubiaceae-Paederieae]; foliis saepissime ovato-lanceolatis basi cuneatis sicco pallidis supra glabris subtus subtomentellis distincta.

Caules volubiles, glabri, mox stramineo-brunnei. *Folia* ovato-lanceolata angusteve elliptica, apice subacuminata, basi late cuneata, 5–17 cm. longa, 3·5–5·7 cm. lata, rigide chartacea, sicca pallescentia, supra glabra, subtus minute subtomentella, costa supra conspicua vel leviter impressa subtus prominente, nervis lateralibus utrinque 6–7 superioribus intra marginem longius prorsus currentibus supra plus minusve conspicuis subtus prominentibus, nervis transversis numerosis subtus prominulis, nervulis rete subtus prominulum efficientibus, petiolo usque ad 1·5 cm. longo supra canaliculato suffulta ; stipulae usque ad 9 mm. longae. *Paniculae* et axillares et terminales, infructescentes 3–16 cm. longae, 2–6 cm. latae, rhachi ramulisque puberulis. *Receptaculum* puberulum. *Calycis* segmenta deltoidea, obtusa, 1·25 mm. longa. *Corolla* haud visa. *Discus* columnaris, calyce paululo longior. *Fructus* ambitu elliptico-ovatus, stramineus, compressus, pyrenis 8 mm. longis 6 mm. latis atris pallide lineolatis late stramineo-marginatis.

Chiengmai, Mê Awn, 600 m., mixed forest, *Kerr* 4711.

Paederia pilosa *Craib* [Rubiaceae-Paederieae] ; a speciebus aliis receptaculo haud glabro et corolla extra pilosa ob caules et folia pilis longis pallidis instructa nequaquam tomentosa distinguenda.

Caules volubiles, primo longius pallide pilosi, mox glabrescentes, ad 3 mm. diametro, subherbacei. *Folia* lanceolata, anguste lanceolata, vel suboblongo-lanceolata, apice acuta, basi rotundata, truncata, vel cordatula, 4–11 cm. longa, 1–3 cm. lata, membranacea vel chartaceo-membranacea, sicca supra fusco-viridia, subtus viridia, pagina utraque pilosa, pilis ad costam paginae inferioris densioribus patulis, costa supra conspicua subtus prominente, nervis lateralibus utrinque 4–6 supra subconspicuis subtus subprominulis intra marginem anastomosantibus, nervulis pagina utraque plus minusve subconspicuis, petiolo 3–17 mm. longo dense patente piloso suffulta; stipulae late deltoideae, circa 1·5 mm. longae. *Inflorescentia* et axillaris et terminalis, pedunculo communi circa 1 cm. longo incluso ad 2·5 cm. longa, pedunculis partialibus utrinque saepissime 2 ad 7 mm. longis, pedunculis cum rhachi longius pallide pilosis, floribus puniceis (ex *Kerr*) subsessilibus vel breviter pedicellatis. *Receptaculum* circa 1·5 mm. longum, breviter crispatim pilosum. *Calycis* segmenta 5, late lanceolata, 1 mm. longa. *Corolla* extra pilosa, tubo circa 7 mm. longo intra subsparse piloso, lobis brevibus. *Stamina* 5, inclusa, filamentis brevibus ad corollae tubi medium adfixis, antheris 2·25 mm. longis. *Stylus* 3·25 mm. longus, stigmatibus filiformibus 5·5 mm. longis.

Krabin, Bupram, 100 m., evergreen forest, *Kerr* 9823.

Rubia Garrettii *Craib* [Rubiaceae-Galieae] ; a *R. tibetica* Hook. f., cui habitu subsimilis, foliis petiolatis minus scabridis recedit.

Herba scandens ; caules laeves, angulati vel angustissime alati, ad 1·5 mm. diametro. *Folia* opposita, i.e. cum stipulis per 4 pseudo-verticillata, ovato-lanceolata, oblongo-lanceolata, vel rarius lanceolata, apice acuta, breviter reflexa, basi cuneata vel rotundata, ad 2 cm. longa et 0·7 cm. lata, chartacea, sicca brunnea vel fusco-brunnea, subtus parum pallidiora, supra ad costam breviter setulosa, aliter glabra, subtus glabra, costa supra conspicua subtus prominula, trinervia vel subtriplinervia, nervis lateralibus pagina utraque praecipue inferne conspicuis, margine anguste revoluta, petiolo 2–11 mm. longo infra setis rigidis recurvis instructo suffulta ; stipulae foliis similes sed paulo minores. *Infructescentia* axillaris, plus minusve corymbiformis, ad 2 cm. diametro, pedunculo communi saepissime 1·5 cm. longo suffulta, glabra. *Fructus* ater (ex *Garrett*), vix maturus ad 5 mm. diametro, glaber.

Doi Angka, 2430 m., marsh, *Garrett* 325.

Scabiosa siamensis *Craib* [Dipsacaceae] ; ab affini *S. Hookeri* C. B. Clarke pedunculis primo crispatim pubescentibus mox crispatim puberulis et foliorum indumento sparso brevi distinguenda.

Herba perennis, circa 30 cm. alta, radice lignosa. *Folia* radicalia, oblongo-oblanceolata vel oblanceolata, apice subobtusa, basi angustata, decurrentia, ad 13 cm. longa et 4·2 cm. lata, rigide chartacea, sicca plus minusve cyanea, pagina utraque ad nervos pilis sparsis crispatis instructa vel superiore fere glabra, costa supra conspicua subtus prominente, nervis lateralibus utrinque 6–8 supra conspicuis vel impressis subtus plus minusve prominentibus, nervulis paucis supra saepe impressis subtus conspicuis, margine regulariter vel irregulariter grossius serrata, petiolo lamina decurrente anguste alato ad 4 cm. longo suffulta. *Pedunculi* solitarii vel ad quattuor, ad 30 cm. alti, apice densius crispatim pubescentes, inferne crispatim puberuli. *Capitula* solitaria, floribus apertis inclusis ad 4 cm. diametro ; involucri bracteae ligulatae vel spatulato-ligulatae, apice rotundatae, ad 1·7 cm. longae et 0·5 cm. latae, breviter subadpresse pubescentes ; receptaculum pubescens ; bracteolae lanceolatae, inferne longe attenuatae, stipite incluso ad 9 mm. longae, 1·25 mm. latae ; involucellum sericeum, circa 5 mm. longum, lobis longioribus 1·3 mm. longis. *Calycis* setae 15, circa 7·5 mm. longae, barbellatae. *Corolla* alba (ex *Put*), extra pilosa, tubo ad 1 cm. longo, lobis 4 ellipticis 3·5 mm. longis 2·75 mm. latis. *Stamina* 4, filamentis apicem versus corollae tubi insertis 1 cm. longis. *Stylus* staminibus paulo brevior.

Doi Chiengdao, *Put* 411.

VI.—BOTANICAL TERMS IN PLINY'S NATURAL HISTORY. T. A. SPRAGUE.

The most varied estimates have been given of Pliny's " Historia Naturalis." Its intrinsic scientific value is very slight, as it is merely an uncritical compilation from the works of previous writers, dealing with all branches of knowledge and superstition. Historically, on the other hand, it is of high importance—at any rate so far as botany is concerned—since it represents the state of knowledge and the

views current in the first century of the Christian era. According to Singer's " From Magic to Science " (1928), p. 12, it contains extracts from about 2,000 works—most of them now lost—by about 146 Roman and 326 Greek authors.

The early herbals of the sixteenth century, such as those of Brunfels and Fuchs, were based primarily on Dioscorides, but drew largely also on Pliny, from whom much of their terminology was taken. His " Historia Naturalis " is consequently the source of many of our modern botanical terms. Some of these, however, were employed by Pliny in such different senses that acquaintance with modern terminology is a positive hindrance rather than a help in understanding their meaning, owing to the paralysing influence of the preconceived idea.

The history of botanical terminology has yet to be written, though many individual terms have been traced to their sources. As a beginning, a glossary of the botanical terms used by Pliny is now given, and it is hoped to follow this with similar accounts of the terminology employed by Isidorus (A.D. 560–636), Albertus Magnus (1206–80), and that used in the sixteenth-century Latin translations of Dioscorides.

The following are modern botanical terms employed by Pliny only in non-botanical senses: bractea, lamina, ligula, lomentum, ocrea, pistillum, pollen, ramenta, stigma, stilus, strophiolum, vernatio. These are included in the list for the sake of convenience. Among those used by him with different or additional botanical meanings are: adnatus, bacca, calyx, capitulum, cortex, cyma, folliculus, germinatio, racemus, siliqua, stipula, thyrsus; satus meant not only " sowing," but also " seeding " and " planting," and serere had a corresponding range of meaning; frutex and fruticosus are included below because they did not necessarily indicate woody plants, but sometimes herbs with a bushy mode of branching, as in the case of *Chelidonium majus*; serratus is included because it covered " crenate " as well as " serrate," and saepes because it meant " fence " as well as " hedge." Ala was used by Pliny in the now obsolete senses of axil and axillary shoot, and apices for the anthers of *Rosa*; while internodium, herbaceus (green), samara (fruit of *Ulmus*), stamen, and unguis (claw of a petal) were employed by him for the first time in their modern significations, except that samara and unguis occur also in Columella.

Pliny had little or no idea of comparative morphology: to him, radix was a root or any underground stem (rhizome, tuber, or bulb); bulbus was a bulb, corm or tuber; and semen a seed or seed-like fruit. He used pediculus with the general signification of little stalk, whether short-shoot, petiole, petiolule, peduncle or pedicel. Caput and folliculus are examples of other words employed by him in very varied senses.

It is hoped that the glossary may also be helpful to those who have occasion to consult Pliny's " Historia Naturalis " in the original Latin, since the existing English translations are not very satisfactory. Each meaning of a word is followed by a reference to a passage in which it is so applied, the volume, page and line of the Latin edition by Harduinus (1723) being cited. That edition contains copious and valuable explanatory notes. Where the meaning of a particular passage or word in Pliny seemed doubtful, the corresponding passages, if any, in Dioscorides (ed. Sprengel) and Theophrastus (ed. Hort) were consulted, and the passage in Pliny was then reviewed in the light of the identifications supplied by Sprengel and Hort. Lewis and Short's Latin dictionary is most helpful, but not entirely trustworthy. In Pliny at all events, calyculus does *not* mean " a small flower-bud, the cup or calyx of a flower " : it is used in the " Historia Naturalis " for the siliqua of *Glaucium* and the capsule of *Hypericum*. Similarly, whatever tŭber was, it was certainly not a kind of apple tree : it may have been the nectarine.

Considerable care has been taken to check the meanings and identifications given below, but it would be too much to hope that no mistakes have crept into the list, and the writer will accordingly be grateful for notes of any corrections that may be required in it.

GLOSSARY.

acinus, (1) berry or other fleshy fruit, usually with soft flesh, e.g. of *Vitis, Sambucus, Hedera*, i. 750, ll. 23, 25 ; (2) berry-like seeds of *Punica*, i. 696, l. 22 ; 750, l. 25 ; ii. 425, l. 16.

aculeus, (1) spine, e.g. of *Rhamnus*, ii. 346, l. 17 ; (2) prickle, e.g. on leaves of thistles, ii. 249, l. 27 ; 250, l. 8.

adnatus, growing on, e.g. branches on a main stem, ii. 433, l. 13.

ala, wing, armpit, hence (1) leaf axil, ii. 429, l. 29 ; 434, l. 20 ; (2) axillary shoot, ii. 420, l. 20 ; 433, l. 9.

alabaster, lit. pointed perfume box, hence applied to the pointed flower-bud of *Rosa*, ii. 235, l. 23.

alburnum, outer part of sapwood, ii. 31, l. 20.

apex, lit. summit, top, applied to anther of *Rosa*, ii. 235, l. 24 : " in calycis medio sui stantis complexa luteos apices."

arista, awn of grasses, ii. 106, l. 21 ; 432, l. 10.

bacca, (1) berry or drupe, usually with firm flesh, e.g. of *Myrtus, Hedera, Cerasus, Prunus, Olea*, i. 667, l. 4 ; 733, l. 6 ; 752, l. 10 ; ii. 316, l. 33 ; 339, l. 6 ; (2) round fleshy cone of *Juniperus*, ii. 335, l. 18 ; (3) round cone (first fleshy then woody) of *Cupressus*, ii. 20, l. 29 ; (4) involucrate infructescence of *Fagus*, ii. 4, l. 7.

balanus, (1) acorn, nut of *Quercus* (esculus) ii. 72, l. 2 ; 4, l. 23 ; (2) *sardiani balani*, Sardian chestnuts (*Castanea*), i. 749, l. 22 ; (3) = *myrobalanus*, seed of *Moringa* (ben), ii. 273, l. 15 ; cf. i. 670, l. 25 : " premunt medici nucleos, tundentes affusa eis paulatim calida aqua " ; (4) the tree which bears myrobalani (*Moringa*), i. 688, l. 13 ; (5) date, fruit of *Phoenix dactylifera*, i. 686, l. 4 ; (6) suppository (from its shape), ii. 194, l. 16 ; 398, l. 32 : " haemorrhoidas pellere, subditas pro balanis," " balanis subditis."

bractea, thin plate or layer of metal or wood, ii. 616, l. 2; 39, l. 28.

bulbus, (1) bulbous plant, ii. 61, l. 18; (2) bulb, e.g. of *Lilium*, ii. 480, l. 28; (3) corm, e.g. of *Crocus*, ii. 238, l. 13; (4) tuber, e.g. of orchids, ii. 428, l. 24.

caducus, (1) deciduous, ii. 67, l. 18; (2) inclined to fall, ii. 86, l. 5; (3) perishable, i. 691, l. 24.

calamus, (1) cane, reed, ii. 27, ll. 11, 20; 28, ll. 6, 9, 11; (2) culm of cereals, straw, ii. 106, l. 21; 107, l. 30; (3) peduncle of *Nelumbo nucifera*, ii. 115, l. 20; (4) graft, scion, ii. 64, ll. 9, 22, 23; 68, l. 32.

calyculus, (1) siliqua of *Glaucium flavum*, ii. 218, l. 27; (2) capsule of *Hypericum*, ii. 424, l. 16.

calyx, cup, covering, rind: (1) involucre of *Castanea sativa* and (cupule) of *Quercus*, i. 749, l. 17; ii. 4, ll. 11, 19; (2) involucre of *Tragopogon*, ii. 440, l. 9; (3) involucre of *Gossypium*, i. 658, l. 8; (4) cup-like perianth of *Lilium*, ii. 236, l. 37; (5) calyx, cup formed by sepals of *Rosa*, ii. 254, l. 8; (6) corolla, cup formed by petals of *Rosa*, ii. 235, l. 24; (7) corona of *Narcissus*, ii. 237, l. 9; (8) cup-like capsule of *Papaver*, ii. 217, l. 23; 260, l. 5; (9) pericarp of *Punica Granatum*, ii. 565, l. 32; (10) fleshy outer pericarp of *Juglans regia*, i. 748, l. 15; (11) covering of wax, etc. round fruits to preserve them, i. 743, l. 23; (12) outer covering of a charcoal-heap, ii. 5, l. 5.

capillaceus, capillary, hair-like, i. 672, l. 25; 700, l. 10.

capillamentum, (1) hair (coll.), ii. 8, l. 9; 238, l. 24; (2) slender rootlet, ii. 434, l. 21.

capillatus, (1) clothed with hair, ii. 40, l. 8; (2) capillary, hair-like, ii. 17, l. 7; 170, l. 13.

capillus, (1) hair (coll.), ii. 88, l. 24; 278, l. 24; (2) stamens of *Crocus* and *Rosa*, ii. 238, l. 21; 254, l. 8.

capitatus, having or forming a head or bulb, applied to: (1) plants bearing capitula, e.g. *Filago*, ii. 353, l. 20; (2) plants forming large bulbs, e.g. *Allium Cepa*, ii. 171, l. 14.

capitulum, lit. little head, applied to: (1) capitulum of Compositae, ii. 353, l. 20; 424, l. 10; 428, l. 7; (2) false capitulum of *Dipsacus*, ii. 429, l. 19; (3) subglobose verticillaster of *Marrubium*, ii. 365, l. 14; (4) flower of *Hypericum*, ii. 424, l. 15; (5) nutlet of *Echium*, ii. 376, l. 2.

capreolus, tendril of *Vitis vinifera*, ii. 82, l. 3.

caput, lit. head, applied to: (1) bulb of *Allium*, ii. 171, ll. 5, 34; (2) head-like inflorescence, e.g. of *Euphorbia* and Umbelliferae, ii. 401, l. 6; 438, l. 29; (3) capitulum of *Senecio vulgaris*, ii. 386, l. 10; (4) capsule of *Papaver*, ii. 218, l. 12; (5) flower (and especially the receptacle) of *Nelumbo nucifera*, ii. 115, l. 20; "simile caput papaveri colore roseo: in eo fabae non super tricenas;" (6) hip (fleshy pseudocarp) of *Rosa*, ii. 254, l. 22.

carnosus, fleshy, applied to: (1) roots, ii. 170, l. 14; (2) bulb-scales, ii. 164, l. 21; (3) leaves, ii. 17, l. 8; (4) fruits, i. 750, l. 9; (5) the wood of the cherry, as contrasted with that of the olive, ii. 31, l. 23; (6) resin, i. 736, l. 1; ii. 332, l. 2.

caro, flesh, pulp, (1) flesh of fruits and seeds, i. 750, ll. 9, 10; 752, l. 10; ii. 312, l. 26; (2) inner part of sapwood, ii. 31, l. 22.

caudex, *codex*, trunk of tree, i. 687, l. 11; ii. 21, l. 20.

cauliculus, *coliculus*, (1) small stem, ii. 384, l. 21; 439, l. 24; (2) branchlet, ii. 316, l. 5; 322, l. 9; (3) lateral shoots of cabbage (sprouts), ii. 176, l. 16.

caulis, *colis*, (1) stem, e.g. of *Faba* and *Verbascum*, ii. 115, l. 11; 378, l. 25; (2) cabbage, *Brassica oleracea*, ii. 87, l. 19.

circinatus, rounded, applied to the leaves of *Pyrus communis*, ii. 17, l. 19; and the young leaves of *Populus alba* and *P. nigra*, ii. 16, l. 22.

cirrus, tufted branchlet of *Equisetum*, ii. 395, l. 27.

clavicula, tendril of *Vitis vinifera*, ii. 297, l. 7.

coma, lit. hair of the head, hence applied to: (1) foliage, i. 672, l. 21; ii. 15, l. 12; (2) crown-like inflorescence of *Hypericum* and reeds, ii. 422, l. 21; 27, l. 16.

comosus, leafy, with much foliage, ii. 4, l. 29; 401, l. 15.

corolla, little garland, ii. 233, l. 23.

corona, garland, wreath, i. 688, l. 24.

coronarius, used for garlands, ii. 259, l. 31.

cortex, (1) bark, ii. 286, l. 20; 22, l. 11; (2) pericarp of nut of *Castanea*, i. 749, l. 19; (3) fleshy torus of *Rosa*, ii. 235, l. 23; 254, l. 8.

corymbus, rounded inflorescence or infructescence, e.g.: (1) umbel of *Hedera*, ii. 25, l. 26; umbel of *Pastinaca sativa*, ii. 278, l. 7; (2) verticillaster of Labiatae, ii. 413, l. 28.

crocus, yellow anther of *Lilium*, ii. 236, l. 36; 237, l. 2.

cubitalis, a cubit long, ii. 240, l. 7.

cubitum, ell, cubit, i.e. 17½ in., ii. 383, l. 12.

culmus, stem, especially of cereals, culm, straw, ii. 105, l. 8; 141, l. 12.

cuspis, (1) point, pointed end, spear, ii. 123, l. 21; 262, l. 16; 380, l. 34; (2) bee-sting, ii. 246, l. 31.

cyma, tender sprout of cabbage, ii. 176, l. 13.

deciduus, falling off, deciduous, e.g. of leaves, ii. 131, l. 12; of the flower of *Papaver*, ii. 181, l. 8; of mericarps of Umbelliferae, ii. 160, l. 19.

dehiscere, to burst open, split open, applied to a rosebud, ii. 235, l. 24, and to "siliquae" (i.e. pods), i. 658, ll. 13, 14.

divisus, divided, lobed, applied to the palmatifid leaves of *Platanus orientalis*, ii. 17, l. 10, the pinnatifid leaves of *Capsella Bursa-pastoris*, ii. 439, l. 24, and the bipinnatifid leaves of *Papaver Argemone*, ii. 375, l. 28.

dodrans, a measure of 9 inches, i. 373, l. 22; ii. 736, l. 15.

dodrantalis, nine inches long, ii. 292, l. 5.

echinatus, like a hedgehog (*echinus*), prickly, e.g. the involucre of *Castanea*, i. 749, l. 17; and the false capitulum of *Dipsacus*, ii. 429, l. 20.

enodis, without knots, applied to timber, i. 657, l. 13; ii. 12, l. 14.

exalbidus, whitish, i. 667, l. 15; ii. 353, l. 14.

excurrere, to sprout, shoot forth, ii. 82, l. 25.

fasciculus, bundle, bunch, ii. 156, l. 16 ; 179, l. 14 ; 304, l. 23.

filum, lit. thread, applied to the style of *Lilium*, ii. 236, l. 36.

fimbriatus, fringed, ciliate, clothed with fibrous rootlets, ii. 249, l. 17 ; 366, l. 8 ; 381, l. 4.

fistula, (1) pipe, tube, hollow reed, i. 671, l. 9 ; (2) ulcer, fistula, ii. 410, l. 12.

folium, (1) foliage leaf, ii. 15, l. 21 ; 17, l. 8 ; (2) leaflet of a pinnate leaf, i. 687, l. 5 ; (3) petal of *Rosa*, ii. 254, ll. 6–8.

folliculus (dim. of *follis*), lit. a small bag or sack, applied to : (1) the bladder-like accrescent calyx of *Physalis Alkekengi*, ii. 262, l. 9; (2) the pericarp of *Piper*, ii. 425, l. 7; (3) the husk of cereal grains, ii. 106, l. 24 ; (4) the legume of Leguminosae, e.g. *Acacia*, *Cytisus scoparius*, ii. 337, l. 12 ; 343, l. 23 ; (5) the siliqua of Cruciferae, ii. 173, l. 19 ; (6) the follicle of *Delphinium Staphisagria*, ii. 298, l. 31 ; (7) the capsule of *Euphorbia Lathyris*, ii. 433, l. 6.

frutex, shrub, bush (not necessarily woody), i. 683, l. 7 ; ii. 28, l. 23 ; 127, l. 25.

fruticosus, (1) full of bushes (or bushy trees), i. 323, l. 18 ; (2) much-branched, bushy, ii. 373, l. 19 ; 384, l. 9 ; 385, l. 8 : " fruticosum e radice."

fungosus, spongy, e.g. the pith of *Sambucus*, i. 698, l. 10.

gemma, leaf-bud, ii. 63, ll. 28, 29 ; 68, l. 13 ; 71, l. 8 ; 72, l. 17.

geniculum, lit. a little knee, hence a swollen node of a stem, e.g. of reeds, ii. 340, l. 17 ; of wheat and other cereals, ii. 105, l. 24 ; of *Polygonum*, ii. 436, ll. 3, 5 ; of *Dipsacus*, ii. 429, l. 18.

genus, kind, genus, species, ii. 25, l. 20 ; 241, l. 2 ; 400, l. 7.

germen, leaf-bud, sprout, ii. 18, l. 22 ; 64, l. 17.

germinare, (1) to sprout, shoot, come into leaf, ii. 16, l. 12 ; 18, l. 7 ; (2) to expand, of flower-buds, e.g. *Rosa*, ii. 235, l. 22 ; 236, l. 30.

germinatio, coming into leaf, ii. 18, l. 15.

glans, (1) acorn, nut of *Quercus*, ii. 4, l. 10 : " glanden quae proprie intelligitur, ferunt robur, quercus, esculus, cerrus, ilex suber " ; (2) nut of *Fagus*, ii. 4, l. 5 ; (3) nut-like seed of *Moringa*, i. 670, l. 16.

glaucus, bluish grey, lilac, applied to the flowers of *Verbena officinalis*, ii. 376, l. 10.

granum, (1) grain of cereals, e.g. *Hordeum*, ii. 105, l. 5 ; 106, l. 18 ; (2) pulse, seed of *Phaseolus*, *Lens*, *Cicer*, ii. 116, l. 14 ; 289, l. 15 ; 290, l. 15 ; (3) achene of *Ficus*, ii. 328, l. 24 ; (4) peppercorn, fruit of *Piper*, ii. 320, l. 8 ; (5) cochineal coccus, ii. 6, l. 18.

herbaceus, herbaceous, i.e. green, ii. 399, l. 5 ; 437, l. 12.

herbarius, (1) adj., relating to herbs, e.g. herbaria ars, i. 414, l. 4 ; (2) subst., herbalist, ii. 257, l. 12 ; 387, l. 4 ; 436, l. 19.

herbidus, (1) grassy, covered with herbs, ii. 122, ll. 20, 21 ; (2) obtained from herbs, ii. 331, l. 4 ; (3) herbaceous, i.e. green, i. 663, l. 26.

herbosus, full of herbs, grassy, ii. 122, l. 19.

hirsutus, hirsute, shaggy, villous, hispid, prickly: applied to roots of *Ficus*, ii. 22, l. 22; stem of *Agrimonia Eupatoria*, ii. 368, l. 26; leaves of *Raphanus Raphanistrum*, ii. 202, l. 7; stem and leaves of *Galium Aparine*, ii. 353, l. 32.

hirtus, hairy, shaggy, in Pliny applied only to men, animals and comets, not to plants, i. 88, l. 8; 329, l. 11; 373, ll. 11, 16.

hispidus, rough, shaggy, bristly, i. 499, l. 15; ii. 4, l. 11; 268, l. 30; 384, l. 4.

horridus, (1) bristling, bristly, i. 665, l. 12; ii. 167, l. 9; 429, l. 18; hence (2) harsh, raw, ii. 207, l. 16.

humor, lit. liquid, moisture, applied to sap, latex or resin of trees, ii. 31, l. 14.

imbricatus, shaped like a gutter-tile, i. 754, l. 26; ii. 243, l. 9.

incisura, (1) lit. cut, incision, i. 687, l. 22; (2) incision of a leaf, ii. 251, l. 5; 397, l. 17; (3) of a serrate margin of a leaf, i. 697, l. 15.

incisus, (1) lit. cut into, cut open, ii. 378, l. 13; (2) incised, e.g. the pinnatisect leaves of *Agrimonia Eupatoria*, ii. 368, l. 27.

insitum, graft, scion, ii. 67, l. 15.

internodium, space between two successive joints, internode, i. 372, l. 22; ii. 28, ll. 10, 18; 105, l. 29; 299, l. 19; 354, l. 15.

iulus, male catkin of *Corylus*, ii. 21, l. 17.

juba, lit. mane, crest, hence applied (like *coma*) to the crown of branchlets and foliage of trees, i. 323, l. 19.

lacinia, flap, applied to the foliaceous bract on the cladode of *Ruscus Hypophyllum* or *R. Hypoglossum*, i. 755, l. 4.

laciniosus, full of folds, applied to the leaves of *Alisma Plantago-aquatica*, ii. 379, l. 15.

lamina, (1) thin plate or leaf of metal, ii. 233, l. 24; (2) veneer of wood, ii. 38, l. 29; 39, l. 12.

lappa, (1) bur, also the burdock and other bur-plants, ii. 251, l. 21; 353, l. 33; 401, l. 1; (2) bur-nutlets of Boraginaceae, ii. 372, l. 3; 376, l. 3.

liber, inner smooth bark of trees, i. 654, l. 6; 689, l. 16.

lignum, (1) wood, ii. 12, l. 29; 13, l. 10; (2) woody shell (pericarp) of nuts, i. 752, l. 12; (3) stone (endocarp) of drupes, e.g. of *Olea*, *Cerasus*, *Amygdalus*, *Prunus*, i. 752, ll. 9, 12; (4) stone (hard endosperm) of date, i. 684, ll. 22, 30.

ligula, spoonful, ii. 193, l. 16; 331, l. 20.

loculosus, full of little compartments, plurilocular, i. 748, l. 23.

lomentum, bean-meal, ii. 114, l. 25; 748, l. 6.

malleolus (dim. of *malleus*, hammer, mallet), hammer-headed slip or cutting, mallet-shoot, ii. 72, l. 29; 74, l. 1; 75, ll. 11, 13.

mammosus, protuberant, i. 741, l. 18.

marcescere, (1) to wither, fade, ii. 233, l. 7; 245, l. 6; 260, l. 20; (2) to decay, ii. 37, l. 26.

materia, *materies*, wood, timber, ii. 12, l. 25; 35, l. 22; 48, l. 23.

medulla, (1) pith, e.g. of *Sambucus* and *Juncus*, i. 743, l. 24; ii. 253, l. 3; (2) heart-wood, ii. 11, l. 17.

mollis, soft, (1) in substance, tender, ii. 35, l. 28; 268, l. 29; 316, l. 8; 338, l. 25; (2) to the touch, i. 747, l. 16; ii. 258, l. 31.

mucro, sharp point or edge, applied to end of leaf-segments of palms, i. 683, l. 16; to end of leaf of *Pinus*, ii. 8, l. 9; to leaves of "tripolium," ii. 396, l. 8.

mucronatus, pointed, applied to the leaves of *Pyrus Malus* and *Sedum reflexum*, ii. 17, l. 9; 385, l. 9.

nervosus, stringy, fibrous, full of fibres, ii. 242, l. 15; 437, l. 14.

nervus, nerve, fibre, ii. 16, l. 29; 169, l. 2; 346, ll. 3, 5.

nodosus, containing or full of knots, ii. 12, l. 26; 34, l. 4.

nodus, lit. a knot, (1) a knot in timber, i. 686, l. 21; ii. 32, l. 4; (2) a node of the stem, e.g. of a reed, ii. 27, l. 15; 71, l. 8; of *Vitis vinifera*, ii. 72, l. 11.

nucamentum, fir-cone, ii. 9, l. 25.

nucleus, (1) kernel, e.g. of *Amygdalus*, *Cerasus*, *Juglans*, *Corylus*, i. 739, l. 22; ii. 309, l. 25; 318, l. 10; 773, l. 7; of *Pinus*, i. 738, l. 14; (2) hard seed of a berry or pome, e.g. of *Vitis*, *Malus*, *Pyrus*, ii. 57, l. 5; 298, l. 11; 566, l. 3; (3) hard part of seeds of *Punica*, ii. 312, l. 24.

nux, (1) nut, e.g. of *Corylus*, *Castanea*, *Juglans*, *Pistacia*, i. 749, ll. 1, 16; ii. 319, l. 13; 320, ll. 6, 11; (2) nut-tree, i. 686, l. 14; ii. 21, l. 22; (3) pine cone, ii. 318, l.15.

oblongus, rather long, oblong, i. 742, l. 5; ii. 173, l. 17; 361, l. 29.

ocrea, greave, legging, i. 415, l. 12.

oleraceus, resembling a potherb, ii. 403, l. 24.

olus, vegetable, potherb, ii. 87, l. 19.

ossa (pl. of *os*), lit. bones, applied to heartwood of trees, ii. 31, l. 22.

palmes, (1) young shoot of *Vitis*, ii. 74, l. 3; 76, ll. 6, 30; (2) spadix of *Phoenix dactylifera*, i. 683, ll. 15, 21, 23.

pampinosus, tendril-bearing, cirrhiferous, ii. 299, l. 19.

pampinus, (1) young tendril-bearing shoot of *Vitis vinifera*, ii. 79, l. 13; 82, l. 26; (2) tendril, e.g. of *Smilax aspera*, ii. 26, l. 30; 432, l. 29; 433, l. 1.

panicula, (1) panicle, e.g. of a reed, ii. 156, l. 11; (2) tuft of petals of a double rose, ii. 236, l. 13.

pappon, *pappum*, (1) hairs on pedicels of *Rhus Cotinus*, i. 698, l. 5; (2) plumose achene (cypsela) of *Cynara Cardunculus*, ii. 250, l. 16; (3) a name for groundsel, *Senecio vulgaris*, ii. 386, l. 11.

pediculus, little stalk, (1) petiole, ii. 17, l. 12; (2) petiolule, i. 687, l. 6; (3) short-shoot, spur of *Pyrus* and *Malus*, ii. 17, l. 17; (4) peduncle, e.g. of *Ficus*, *Pyrus*, *Quercus*, and *Cucumis*, i. 745, ll. 3, 4; 752, l. 26; ii. 4, l. 26; 165, l. 24; (5) pedicel, e.g. of *Hedera* and *Sambucus*, i. 752, l. 26; (6) stipes of an Agaric, ii. 280, l. 26.

pinnatus, feather-like, hence applied to: (1) the distichous foliage of *Abies*, ii. 9, l. 24; (2) the pinnately arranged leaflets of *Fraxinus*, ii. 12, l. 11; (3) the pinnately divided leaf of Ferns, ii. 430, l. 19.

pistillum, pestle, ii. 626, l. 6.

pollen, flour, fine powder, ii. 169, l. 8 ; 332, l. 30.

pomum, edible fruit, e.g. of *Malus*, *Pyrus*, *Cerasus*, *Punica*, *Phoenix dactylifera*, *Ficus*, i. 683, l. 14 ; 684, l. 22 ; 687, l. 10 ; 750, l. 30 ; ii. 21, l. 6 ; 313, l. 12 ; 314, l. 9 ; 327, l.12.

propago, turion, layer (hortic.), ii. 63, ll. 5, 10.

putamen, (1) shell (pericarp) of a nut, i. 752, l. 13 : "putamine clauduntur nuces" ; (2) shell (endocarp) of walnut, *Juglans*, ii. 319, l. 21 ; 537, l. 11 ; (3) stone (endocarp) of almond, *Amygalus*, i. 688, l. 9 ; (4) shell of a pod, e.g. of *Faba*, ii. 87, l. 20 ; (4) rind (pericarp) of *Punica*, ii. 289, l. 10.

quincuncialis, (1) 5 inches long, i. 531, l. 6 ; ii. 433, l. 17 ; (2) planted in the form of a quincunx, ii. 60, l. 6.

racematus, clustered, bearing clusters, ii. 105, l. 16.

racemus, (1) peduncle, i. 752, l. 26 ; ii. 20, l. 15 ; (2) bunch of berries (thyrse) of *Vitis*, i. 712, l. 10 ; and (umbel) of *Hedera*, ii. 25, l. 25.

radix, root, underground stem : (1) root, ii. 22, l. 16 ; (2) rhizome, ii. 28, l. 4 ; (3) tuber, ii. 384, l. 22 ; (4) bulb, ii. 260, l. 27.

ramenta (pl.), scrapings, shavings, chips, ii. 190, l. 3 ; 316, l. 17 ; 327, l. 1.

ramulus, lit. branchlet : (1) branchlet, e.g. of *Filago*, ii. 353, l. 20 ; 370, l. 9 ; 376, l. 8 ; (2) stem, ii. 347, l. 24 ; (3) rhachis of pinnate leaf of *Astragalus Poterium*, ii. 437, l. 11 ; (4) rhachis of a Fern leaf, ii. 275, l. 28.

ramus, lit. branch : (1) main branch, bough of a tree, e.g. of *Ficus*, i. 687, l. 20 ; (2) branch of a herb, e.g. of *Ruta*, ii. 179, l. 11 ; (3) rhachis of a pinnate leaf, e.g. of *Rhus*, i. 687, l. 6.

regerminare, to shoot forth again, ii. 25, l. 1 ; 174, l. 3.

regerminatio, shooting forth again, ii. 71, l. 11 ; 174, l. 5.

rosaceus, made of, or from roses, i. 737, l. 18 ; ii. 234, l. 10.

saepes, (1) hedge, i. 657, l. 19 ; (2) fence, i. 441, l. 3.

samara, fruit of *Ulmus*, ii. 14, l. 9 ; 59, l. 19.

sarmentum, slender branch or branchlet, ii. 56, l. 6 ; 290, l. 21 ; 299, l. 19.

satus, sowing, seeding, planting : (1) sowing, ii. 104, l. 20 ; 167, l. 11 ; (2) seeding, i. 746, l. 9 ; (3) planting, e.g. of cuttings, ii. 67, l. 34.

scapus, (1) stem, i. 698, l. 12 ; ii. 365, l. 13 ; (2) peduncle, ii. 115, l. 19 ; 181, l. 5 ; 217, l. 24.

scopa, (1) slender branch, e.g. of *Marrubium* and *Origanum*, ii. 224, l. 22 ; 272, l. 23 ; (2) broom made of the branches of *Ruscus aculeatus*, ii. 322, l. 23.

semen, seed or seed-like fruit, ii. 183, l. 5 ; 14, l. 10.

sepes, vide *saepes*.

serere, to sow, plant, (1) to sow seeds or fruits, ii. 57, ll. 27, 28 ; 128, l. 3 ; (2) to plant cuttings, ii. 58, l. 18 ; 67, l. 33 ; 179, l. 9.

serratus, serrate, crenate, ii. 347, l. 15 ; 372, l. 20.

sessilis, (1) sitting or inserted on : "pira . . . minimo pediculo sessilia," i. 742, l. 4 ; (2) without a stem, i.e. low, dwarf, ii. 174, l. 20.

siliqua, (1) pod (legume) of Leguminosae, e.g. *Ceratonia Siliqua, Faba, Cicer, Pisum, Vigna*, i. 722, l. 31 ; 750, l. 5 ; ii. 105, l. 10 ; 115, l. 11 ; 116, l. 13 ; (2) the Carob tree, *Ceratonia Siliqua*, ii. 550, l. 22 ; (3) capsule of *Euonymus europaeus, Fagonia cretica, Hypericum, Rhinanthus*, i. 697, l. 20 ; ii. 250, l. 22 ; 403, l. 24 ; 424, l. 29 ; (4) follicle of *Paeonia*, ii. 431, l. 17.

silvestris, lit. belonging to or living in a wood, hence growing wild, i. 739, l. 3 ; ii. 167, l. 9.

soboles, suboles, basal shoot, sucker, ii. 58, l. 3.

spatha, (1) spatula, ii. 662, l. 4 ; (2) spathe of a palm infructescence, ii. 20, l. 15.

spathe, a tree also known as *elate*, i. 675, l. 26 ; ii. 311, l. 14.

species, particular kind, species, ii. 25, l. 22 ; 241, l. 2.

spica, (1) ear of corn, spike, ii. 20, l. 14 ; 109, l. 9 ; (2) spicate inflorescence, e.g. of *Celosia*, ii. 241, l. 9.

spina, (1) thornbush, thorntree, ii. 57, l. 19 ; 343, ll. 13, 16, 17, 21 ; (2) prickle, e.g. of *Rubus, Carduus* and *Dipsacus*, ii. 31, l. 11 ; 428, l. 6 ; 429, l. 18 ; (3) spine-like leaf, e.g. of *Juniperus*, ii. 17, l. 8.

spithama, span, i.e. 9 in., i. 373, l. 22.

stamen, lit. thread, applied to : (1) fibre of wood, ii. 32, l. 10 ; (2) stamen of *Lilium*, ii. 236, l. 37.

stigma, scar, ii. 387, l. 2.

stilus, pointed instrument, ii. 126, l. 3 ; 666, l. 15.

stipes, trunk, ii. 89, l. 15.

stipula (dim. of *stipes*), (1) culm of a grass, ii. 114, l. 15 ; 292, l. 20 ; (2) straw, ii. 140, l. 37.

stirps, (1) root-stock, ii. 28, l. 3 ; (2) lower part of plant, ii. 165, l. 26 ; (3) main stem, trunk, ii. 87, l. 9 ; (4) stem, i. 453, l. 25.

stolo, sucker, water-shoot, ii. 48, l. 9 ; 71, l. 23.

strophiolum, a small wreath, ii. 233, l. 11.

succosus, full of juice, i.e. fleshy, applied to the leaves of *Sedum reflexum*, ii. 385, l. 9 ; full of latex, e.g. the stem of *Euphorbia Characias*, ii. 400, l. 9.

surculosus, shrubby, woody, twiggy, many-stemmed, ii. 105, l. 30 ; 243, l. 14 ; 413, l. 27.

surculus, (1) branchlet, twig, ii. 275, l. 12 ; 322, l. 11 ; 512, l. 12 ; (2) scion, graft, ii. 64, l. 10.

talea, cutting, ii. 57, l. 16 ; 67, l. 34.

tegmen, covering, cover, hence applied to the pericarp of *Punica Granatum*, ii. 282, l. 13 ; 289, l. 13.

thyrsus, spear-like stem, e.g. of *Lactuca* and *Asparagus*, ii. 175, l. 15 ; 177, l. 27.

trientalis, four inches long, ii. 423, l. 31.

truncus, trunk of tree, bole, ii. 65, l. 13.

tūber, n. (plur. tūbera), lit. a swelling, hence : (1) burr on tree-trunk, e.g. of *Acer* and *Alnus*, ii. 13, ll. 14, 17 ; (2) truffle, ii. 159, ll. 12, 29 ; (3) tuber, e.g. of *Aristolochia*, ii. 374, l. 19. (4) " tuber terrae "=*Cyclamen*, ii. 377, l. 27.

tŭber, m. and f. (plur. tŭberes), (1) an African-fruit-tree, possibly the nectarine, ii. 18, l. 36 ; (2) its fruit, i. 740, ll. 14, 18.

tunica, skin, covering, coat, hence : (1) veil of Agarics, ii. 280, ll. 24, 25 ; (2) bark, e.g. of *Cinnamomum*, i. 669, l. 28 ; (3) inner bark or bast, e.g. of *Tilia* and *Quercus*, ii. 12, l. 29 ; 327, l. 6 ; (4) layer of bark, ii. 2, l. 14 ; (5) leaf-sheath (vagina) of reeds, ii. 28, l. 21 ; (6) bulb-scale, e.g. of *Allium*, ii. 164, l. 21 ; 171, l. 33 ; (7) husk of cereal grains, ii. 106, l. 20 ; 107, l. 30 ; (8) seed-coat (testa), e.g. of *Pinus* and *Faba*, i. 738, l. 15 ; ii. 142, l. 10.

unguis, claw of petal in *Rosa*, ii. 254, ll. 7, 9.

utriculus (dim. of *uterus*), husk of grain, ii. 114, l. 16.

uva, (1) a grape, i. 752, l. 15 ; (2) a cluster of grapes, i. 707, l. 6 ; (3) the grape-vine, i. 596, l. 27 ; ii. 219, l. 17 ; (4) clusters of grape-like berries, e.g. of *Laurus*, ii. 21, l. 15.

vasculum, (1) a small vesssel, e.g. *vasculum fictile*, earthenware pot, ii. 384, l. 26 ; (2) capsule of *Sesamum* and *Papaver*, ii. 105, l. 11 ; (3) fruit of *Punica Granatum*, i. 752, l. 27.

vepres, thorn-bush, i. 697, l. 9 ; ii. 579, l. 18.

vernatio, the slough cast off by a snake, ii. 510, l. 12.

vimen, pliant twig, switch, withy, ii. 30, l. 8.

virga, slender straight branch, rod, wand, switch, e.g. of *Myrtus* and *Populus*, i. 738, l. 8 ; ii. 334, l. 12.

vitis, (1) the grape-vine, *Vitis vinifera*, i. 706, ll. 6, 8, 15 ; (2) vine in general, climbing plant, e.g. "vitis alba" (*Bryonia dioica*), "vitis nigra" (*Bryonia alba*), ii. 299, l. 17 ; 300, l. 10.

VII.—SILENE SUBCONICA AND S. JUVENALIS.

W. B. TURRILL.

Silene subconica Friv. was published in Flora, xviii. 334 (1835) with the following brief description. " Calycibus fructus subconicis striatis profunde dentatis, foliis hirsutis lanceolatis, petalis crenatis. Hab. in Rumelia." This description is insufficient to diagnose a species of *Silene* but, fortunately, Grisebach, Spic. flor. rumel. et bithyn. i. 171 (1843), under the name *S. cylindriflora* Otth. (ex diagn.) provides a longer description based on Frivaldszky's specimens which he states were collected " in arenosis maritimis pr. Makri ad litus Aegaeum " and " in montanis circa Philippopolim." Frivaldszky's specimens at Kew are taken as type material.

In the Index Semin. Hort. Monsp. 1836, 28 (1837), Delile described a plant from fields at Port Juvenal under the name *Silene juvenalis*. A copy of Delile's description in Gay's handwriting is preserved at Kew on a sheet sent by Delile to Gay in 1836. This sheet is taken as type material of *S. juvenalis*.

There has been difference of opinion as to whether *S. subconica* and *S. juvenalis* are or are not conspecific. Boissier (Flor. Or. i. 579 : 1867) keeps them distinct and says of the former " differt a *S. Juvenali* calyce angustiora et longiori (7–8 lin. longo lineam 1¼ lato), unguibus exsertis, capsulâ stipite longiori (4 lin. longo) suffultâ."

Rohrbach, Monogr. Silene, 90 (1868), also retains both species. Velenovský, Flor. Bulg. 58 (1891), uses the name *S. subconica* for the Bulgarian material but in his Supplementum, i. 36 (1898), he changes the name to *S. juvenalis*. Halácsy, Conspect. Flor. Graec. I. 161 (1900), has *S. juvenalis* as the name for Thessalian and Greek specimens and also keeps *S. Tempskyana* Freyn et Sint. as a distinct species. Ascherson and Graebner, Synops. v. Abt. 2, 86, give *S. subconica* as a species and *S. juvenalis* as a subspecies. Hayek, Prodr. flor. penins. balc. i. 259 (1924), reduces *S. juvenalis* to a variety of *S. subconia*. Hampe, in Flora, Jahrg. 20, i. 226 (1837), says "*Silene subconica* Friv. ist von unserer *S. conica* nicht verschieden."

The characters used by those authors who retain both *S. subconica* and *S. juvenalis* have been investigated one by one and it has become clear that they have no value for differentiating the plants into two species, or even into two varieties of one species. Most, if not all, of the characters have a range of variation which appears to be of a merely fluctuating nature. Such apparently fluctuating characters, often varying on the same specimen and usually in specimens of the same collection, include: the indumentum of the stem and leaves, the shape of the bracts and prophylls, the width of the calyx-teeth and the degree to which the white membranous margin is developed, the slight variations in the degree to which the petal claws are exserted (see, however, the var. *Grisebachii* mentioned below), and the length of the carpophore. The shape of the capsule is a very difficult character to evaluate but no differences as marked as those separating typical *Silene maritima* from typical *S. vulgaris* have been found. So far as ripe seeds are available, no more than slight variations have been found, again nothing so extreme as the contrasting armadillo and tubercled variations occurring in both *S. maritima* and *S. vulgaris*.

In its original French station *S. juvenalis* was certainly an introduced plant. Allowing for this the distribution of supposed *S. juvenalis* and *S. subconica* are within almost the same boundaries, the latter supposedly extending farther north in the Balkan Peninsula.

There being no constant morphological differences correlated with geographical or other isolation, *S. subconia* and *S. juvenalis* have been considered by the writer as one species. Further, with available existing herbarium material it is impossible to separate out any variety, except the var. *Grisebachii* and doubtfully the var. *Tempskyana*.

Davidoff, in Trud. na Blg. Prirod. Druž. viii. 53 (10 of separate) (1915), has described a var. *Grisebachii* of *Silene subconica*. His Latin description reads "Unguibus petalorum longe exsertis, carpophoro longiore (vix 2 mm.), seminibus tuberculatis a typo recedit.—In arenosis maritimis ad ostium rivi Maritza, ad urb. Dede Aghac, Macri et Port-Lagos." A translation of his Bulgarian note is: "It flowers 10–15 days later than the typical kind and is met with in little communities here and there along the sands of our

White Sea [Aegean] coast [i.e. of Western Thrace], which it beautifies by its tall growth and rose-coloured flowers." A specimen collected at Porto Lagos, in dry sandy places, 23.5.30 (*Tedd* 334) is at Kew and agrees with Davidoff's description in having the petal claws exserted (up to 7 mm.) beyond the tips of the calyx teeth. There are no ripe fruits on this specimen but probably the carpophore would be at least 3–4 mm. long. Possibly "mm." in Davidoff's description should be "lin." The long exserted petal claws suggest a character of a mutational nature well marked off from the slight fluctuations seen in a series of *S. subconica* (*S. juvenalis*) specimens from other areas. So far as is known the variety occurs only on the West Thracian coast of the Aegean and may have spread from one place of origin.

Freyn and Sintenis, in Bull. Herb. Boiss. v. 584 (1897), described, as a species, *Silene Tempskyana*, basing their description on material collected in Thessaly, in vineis ad Kalambaka, 4.5.1896 (*Sintenis* 23). A comparison of Sintenis's sheet of this number at Kew with the types and other material of *S. subconica* and *S. juvenalis* shows that the characters relied on by Freyn and Sintenis have no differential value. The specimens are only a robust variety (or even more probably a mere habitat modification) of *S. subconica*. In height they are not taller than Delile's material at Kew. The flowers, and especially the petals, are larger than these in Frivaldszky's specimens, but scarcely exceed those of other Macedonian and Bulgarian material. The calyx shape and stem-indumentum are as in *S. subconica*. The original description is somewhat loose in saying "filamentis . . . glabris supra basin tantum subpubescentibus"—they are markedly pubescent in the lower part as in all plants of this group—and inaccurate in describing the immature capsule as sessile; the carpophore is 1·5 mm. long compared with a carpophore of 2 mm. length in Delile's specimen of *S. juvenalis*, measured from a fruit of corresponding age. At the end of their description and notes Freyn and Sintenis confess that "*S. Tempskyana* dürfte am besten als Unterart der *S. juvenalis* aufzufassen sein." The species is maintained distinct, chiefly on the inaccuracies of the original description, by Halácsy and Hayek.

Accepting *Silene subconica* Friv. in the sense indicated above (i.e. with *S. juvenalis* and *S. Tempskyana* as synonyms and including the var. *Grisebachii*) the following is the species distribution:

S.E. Italy; Greece; Thesaly; N. Macedonia; S. Macedonia; Thrace; N. Bulgaria; S. Bulgaria; Rodope Massif; Dobruja; Serbia; Hercegovina; Asia Minor east to Armenia. The species has also been recorded from S. France (Port Juvenal) and Germany (Hamburg and near Berlin).

There remains for consideration the relationship between *S. subconia* and *S. conica* L. Without doubt this is very close. Hampe reduced them to one species, while Otto Kuntze (in Acta Hort. Petrop. x. pt. 1, 174: 1887) makes *subconica* a variety of *conica*.

Kuntze's remarks about the capsules and seeds are confirmed by an examination of the Kew material. There seems, however, sufficiently valid evidence to keep *S. conica* and *S. subconica* distinct. The flowering calyx shape (nearly or quite parallel-sided in *subconica*, widest below the middle in *conica*), the larger petal laminae and their pink colour in *subconica*, and the relatively longer " carpophore " in *conica* are the best morphological characters for differentiation. Further the geographical distribution of *S. subconica*, as here defined, is a natural and practically continuous one, apart from its alien occurrences. The descriptions of *S. conica* in standard floras are mostly incomplete, partially inaccurate, and often conflicting. The degree of glandulosity of the calyces and stems shows a considerable range especially in material from the Mediterranean countries. Very occasionally plants occur which it is difficult to place satisfactorily. Thus the specimens distributed in the Flor. Ital. Exsic. ser. 3, no. 2854, under the name *Silene conica* subsp. *subconica* Friv. (pro. sp.) var. *Montefortiana* Bég. et Ferr. are, from the material seen, doubtfully placed under *S. subconica*. The description reads " Differt a typo descripto a cl. Frivaldszky et Boissier praesertim petalis albis laminis ⅓ brevioribus et unguibus longioribus emarginatis et aliquando bifidis. Forma cultura constans," and the locality is given as Lucania.—Abriola, in pascuis saxosis et in glareosis montis Serra di Monteforte, alt. 1300–1450 m., solo calcareo.—30 May, 1926. Another sheet, with two specimens from Herb. H. Groves, collected " inter segetes," S. Pietro della macchia prope Manduria 4/78, is more typically *S. subconica*. It is not possible to say from the original description alone what *Silene conica* β *glandulosa* of Caldesi in Nuovo Giorn. Bot. Ital. xi. 339 (1879) exactly represents. Ferrari, on the printed label to no. 2854 of the Flor. Ital. Exsic. ser. 3, says that *S. subconica* Friv. is intended. His identification is based mainly on the fact that " Gli esemplari trasmessi dal Caldesi ad alcuni Erbari da me esaminati a quelli conservati nel suo stesso Erbario posti a mia disposizione dalla Direzione dell'Ist. bot. di Bologna, collimano con i macedoni, bulgarici ecc. con cui l'ho confrontati." From the brief description given by Caldesi and from the locality of his material, " in campis arenosis inter sata *all'Isola* prope Faventiam, *in Sarna*," a doubt still remains.

Heldreich, in describing the supposed new species *Glaucium Serpieri* (in Regel, Gartenflora, xxii. 323 : 1873) from Laurion, eastern Greece, refers to the occurrence of *Silene juvenalis* " bei den Bleihütten von Ergastiria " in 1866, and adds " in diesem Jahre (1873) nun fand ich die Pflanze in grosser Masse, nicht nur bei Ergastiria, sondern auch bei Pascha-Limuni und auf den höher im Laurion-Gebirge gelegenen Localitäten Kamariza und Sinterini die alten Halden und Schlackenlager buchstäblich bedeckend und mit ihren schönen hochrothen Blüthen einen herrlichen Anblick gewährend." After describing the *Glaucium* Heldreich puts forward

the suggestion that the sudden appearance of *Glaucium Serpieri* (shown in a forthcoming paper in the K.B. by the present writer to be *G. flavum* var. *leiocarpum*) and of *Silene juvenalis* (=*S. subconica*) in the Laurion area was due to their seeds having remained dormant for 1500 to 2000 years in the soil under the heaps of old mining and smelting debris. When these heaps were removed for re-smelting the seeds were "erst jetzt wieder zu neuem Leben zu erwachen." In the Atti Congr. Internat. Bot. Firenze 1874, 137 (1876) the same suggestion is sustained in the words "il est très probable que ces plantes ont été cultivées jadis par les anciens, et que leurs graines sont ensuite restées enfouies pendant des siècles sous les scories." A detailed taxonomic investigation, an outline account of which is given above, has shown that *S. juvenalis* is conspecific with *S. subconia*, a not uncommon species in the countries around the Aegean Sea. There is nothing in the taxonomy or distribution of *S. subconica* to make it *a priori* improbable for it to occur naturally in the Laurion district. No evidence of its cultivation by the ancients has been found. Its natural habitat is in rather open communities and grasslands in early successional stages and, like some other species of the genus, it will quickly spread into loose terrain. Further, *Silene vulgaris* seeds certainly do not retain their vitality for a period of great length (probably 10 years is a normal maximum), and structurally there is nothing to suggest long retained vitality as a character of *S. subconica* seeds. Lastly, the details given by Heldreich are insufficient to prove his case. In all probability both the *Glaucium* and the *Silene* were in the neighbourhood before the heaps of débris were removed and simply spread rapidly on the vacated and denuded ground in the absence of close competition. The evidence is all against either *Glaucium* or *Silene* at Laurion being examples of long enduring seed dormancy.

VIII.—A NEW PYRETHRUM. A. R. HORWOOD.

In July 1932 a *Pyrethrum* was forwarded to Kew by Dr. F. Lemperg, of Hatzendorf, Austria, raised from seeds from Mr. Ingwersen and believed to be *P. densum*. Dr. Lemperg remarked that he did not consider the specimen to be this plant, but that it represented an undescribed species. This agreed with a view which had already been reached at Kew during a re-arrangement of the genus *Chrysanthemum* in the Herbarium. Amongst the material in the Herbarium named *P. Aucherianum* DC., cultivated specimens had been found which were identical with Dr. Lemperg's plant and these had been set aside to be described later as a new species.

Chrysanthemum (Pyrethrum) praeteritum *Horwood*, sp. nov.; affine *C.* (*Pyrethro*) *Aucheriano* DC., a quo differt habitu diffuso, caulibus ramosioribus, foliis haud bipinnatis et capitulis minoribus.

Suffrutex sempervirens, habitu elato, pluricaulis, caulibus pedalibus vel bipedalibus basi lignosis fusco-brunneis, ramulis juvenilibus lanatis pannosis biennibus, vetustis decorticatantibus cortice scisso demum denudatis, ramis multidivisis vel trichotomis. *Folia* alterna, pinnata, sericeo-pubescentia, usque ad 3–4 cm. longa, circiter 1 mm. lata, foliolis numerosis lineari-lanceolatis crenulatis ad 7 mm. longis 1 mm. latis, inferiora petiolis longioribus instructa. *Petioli* circiter 1·3 cm. longi. *Caules floriferi* monocephali, ramis elongatis tenuibus erectis ad 7·5–15 cm. longis, capitulis solitariis ad 2 cm. latis. *Receptaculum* nudum. *Involucrum* hirtulum, phyllis biserialibus exterioribus ovatis basi subcordatis carinatis margine membranaceis apice scariosis, intimis longioribus oblongis apice late fusco-scariosis. *Flosculi radii*, niveo-albi vel cremei, circiter sedecim, 5–6 mm. longi, iis disci subaequilongi. *Flosculi disci* tubulosi flavi, corolla ovario aequilonga. *Cypselae* corona breviter crenato-dentata instructae, paucicostatae, obsolete striatae, glabrae.

Hab. Patria ignota, verosimiliter Oriens. Cult. in Hort. Bot. Reg. Kew., June 1912 (type), June 1914, Oct. 1918; cult. Hatzendorf b. Fehring, Steiermark, Austria, July 1932, *F. Lemperg*.

This plant has been long known in botanic gardens under the names *Tanacetum Aucherianum* Schultz, *Pyrethrum Aucherianum* DC., *P. densiflorum* auct., and *P. densum* Labill. *P. praeteritum* differs from the last-named species in having the branches of the inflorescence with solitary capitula. In *P. densum* the inflorescence is much branched. The trivial *praeteritum* has been chosen because the plant has been so long overlooked as a distinct species.

The leaves when rubbed give off a rather strong aroma, not altogether unpleasant, and the plant would probably serve as a useful insecticide. With its close, neat habit, it is a suitable dwarf shrub for a Rock Garden. It flowers at Kew in June, and is perfectly hardy in well drained soil.

IX.—NOMENCLATURE OF SOME AUSTRALIAN AND PHILIPPINE ISLANDS PLANTS. C. T. White (Brisbane).

The following notes were made in checking up the naming of some specimens from North Queensland recently.

ELAEOCARPACEAE.

Elaeocarpus Michaelii *C. T. White*, nom. nov.—*E. longipetiolatus* C. T. White in Dept. Agric. Brisbane Bot. Bull. xxi. 3 (1919), non Merrill.

QUEENSLAND.

MYRSINACEAE.

Tetrardisia bifaria (*White et Francis*) *C. T. White*, comb. nov.—*Ardisia bifaria* White et Francis in Proc. Roy. Soc. Queensland, xxxv. 8, 73 (1923). *Tetrardisia disticha* Domin in Biblioth. Bot. xxii. (Heft 89, vi.) 1058 (1928).

QUEENSLAND.

LAURACEAE.

Cryptocarya Merrillii *C. T. White*, nom. nov.—*C. cinnamomifolia* Merrill in Philipp. Journ. Sci. Bot. xii. 128 (1917), non Benth.

PHILIPPINE ISLANDS.

Litsea reticulata (*Meissn.*) *F. Muell.* Census Austral. Pl. 4 (1882) ; F. M. Bailey, Syn. Queensland Fl. 427 (1883).—*Tetranthera reticulata* Meissn. in DC. Prodr. xv. sect. 1, 193 (1864).

QUEENSLAND and NEW SOUTH WALES.

F. Mueller is, so far as I can see, the authority for the above combination credited by Bailey (Queensland Flora, iv. 1312) to Bentham and Hooker, and by F. Mueller (l.c.), Maiden (Forest Flora N. S. Wales, v. 103) and Francis (Australian Rain-forest Trees, 110) to Bentham. The actual combination *Litsea reticulata* was not made in the Genera Plantarum.

X.—MISCELLANEOUS NOTES.

Podostemaceae or Podostemonaceae.—The family name was originally published in the form Podostemeae (Rich. ex H.B.K. Nov. Gen. i. 246 : 1816), and was modified to Podostemaceae by Lindley (Nat. Syst. ed. 2, 190 : 1836). The spelling Podostemoneae was introduced by Reichenbach (Consp. 97 : 1828), and the form Podostemonaceae was apparently used for the first time by Engler (Engl. & Prantl, Nat. Pflanzenfam., Nachtr. zu Teil II–IV. 179 : 1897). Under the International Rules of Nomenclature, the name of a family is formed from that of its type genus by the addition of the suffix -aceae to the stem of the generic name. The correct spelling (under International Rules) of the generic name concerned being *Podostemum*, the family name is therefore Podostemaceae.

The erroneous spellings Podostemoneae and Podostemonaceae were introduced by Reichenbach and Engler respectively, because they employed the Greek form of the generic name, *Podostemon* (which appeared on Michaux's plate), instead of the Latin form *Podostemum* (as published in the text). But the latter form was deliberately adopted by Michaux (Fl. Bor.-Am. ii. 164 : 1803), and must therefore be retained under International Rules. Inspection of the names of other new genera published in the same work shows that, though formed in most cases from Greek words, they were given a latinized ending, e.g. *Leptanthus, Tripterella, Caulophyllum,* except where the resulting Greek name already ended in *-a* or *-is*, e.g. *Dichromena, Oryzopsis.* There were three new generic names formed from two Greek words of which the second was στήμων (stamen), namely, *Brachystemum*, *Petalostemum*, and *Podostemum*. In each case the Latin termination *-um* was adopted. The names *Brachystemum* and *Petalostemum* appeared also on the accompanying plates. The occurrence of the spelling *Podostemon* on the plate of *Podostemum ceratophyllum* is therefore clearly due to an oversight. T. A. S.

Botanical Magazine.—Part iv. of vol. clv. was published on October 8th and contains the following plant portraits, three being of new species: *Iris Dykesii* Stapf (t. 9282), a new species allied to Dykes' *I. chrysographes* and known only from gardens; *Berberis xanthoxylon* Hasskarl (t. 9283), a species native to Java and Sumatra resembling *B. Hookeri*; *Syringa villosa* Vahl (t. 9284), a beautiful pink-flowered Lilac from a small area in the western mountains of Peking, China, which has been confused with *S. pubescens* and *S. emodi*; *Salvia mexicana* Linn. (t. 9285), a native of Mexico; *Coprosma propinqua* A. Cunningham (t. 9286), an interesting New Zealand shrub with white berries; *Ourisia alpina* Poepp. et Endl. (t. 9287), from the Andes of Chile and Argentina; *Tulipa urumiensis* Stapf (t. 9288), a new species allied to *T. australis* Link, a native of Azerbeidjan, Persia; *Primula concholoba* Stapf et Sealy (t. 9289), a new species, belonging to the *muscarioides* series, discovered by Captain Kingdon Ward in the high mountains of the Assam-Burma-Tibet frontier; *Rhododendron floccigerum* Franch. (t. 9290), discovered in 1895 by Pere Soulie in N. W. Yunnan; *Vaccinium retusum* Hook. f. (t. 9291), a native of the Himalaya of Sikkim and Bhutan, and *Papaver triniifolium* Boiss. (t. 9292), with silver glaucous leaves, a native of Inner Eastern Asia Minor.

This Part, which completes vol. clv., is dedicated to Mr. Thomas Hay, M.V.O., V.M.H., Superintendent of the Royal Parks, London, whose portrait forms the frontispiece to the volume.

Sempervivums.*—We have received from the Royal Horticultural Society a copy of a volume by Dr. Lloyd Praeger entitled "Sempervivums." Probably few genera of cultivated plants are in such confusion as the genus *Sempervivum*, and horticulturists, not only in Britain, but throughout the world wherever these hardy succulents are cultivated, will welcome the appearance of this monograph. The author points out the causes which have led to confusion in the past, the chief of which he shows to be hybridization, frequent in the wild state, but wholesale in gardens where many species are grown in close proximity. No plant increases more easily by offsets, and yet seed is frequently saved and distributed with most unfortunate nomenclatural results.

Dr. Praeger spared no pains in collecting and studying the plants in their native haunts, and in order to do so he travelled extensively in Central Europe, including the Balkans, and in Madeira, the Canary Islands, etc. Having acquired his material, he grew it and continued its study for several years in the Dublin Botanic Gardens, either in the open or under glass. The result of his researches is a most valuable treatise which is essential to all horticulturists and botanists interested in the group.

---

* By R. Lloyd Praeger, D.Sc. (London). Published by the Royal Horticultural Society, 1932, pp. 265, 107 figures. Price to Fellows, 15s.; to non-Fellows, 21s.

Aster alpinus and allied species.*—This exhaustive monograph on the *Alpigeni* section of *Aster* describes all the known forms of that polymorphic group, their morphology, distribution and taxonomy receiving full treatment. The work is based on the examination of Herbarium specimens and it may, perhaps, be regretted that attention was not paid also to other aspects of the group, such as ecology, cytology and genetics. If, however, future work on these lines should be attempted, this monograph will form an excellent morphological and taxonomic basis. As in other numbers of this series, the work is beautifully produced, the plates and maps adding much to its value.

The Cactus and its Home.†—This little book should prove of great interest to Cactus-growers in this country. It is written by an acknowledged authority on the family and describes in some detail, and with many photographs, the structure, morphology, taxonomy, ecology and cultivation of the group. It provides, therefore, a background of knowledge which will be of great use to those engaged in the cultivation of American succulents. Of especial interest are the photographs of American Cactus collections, such as the Boyce Thompson Southwestern Arboretum at Superior, Arizona.

Corrigenda.—In K.B. 1932, no. 8, p. 356, line 4, for *C. crassum*, read *C. lactescens*. In the same number, p. 375, lines 20–21 (*Rammell* 1054) should be transferred from *C. melanophengos* to *C. rubrocostatum* on p. 373.

In K.B. no. 9, 1932, p. 453, line 8, *Campanulata spathulata* should read *Campanula spathulata*.

MR. B. L. BURTT.—The Ministry of Agriculture and Fisheries has appointed Mr. B. L. Burtt as Assistant Botanist in the Director's Office.

---

* "Geographisch-Morphologische Studien über Aster alpinus L. und verwandte Arten," Max Onno in Bibliotheca Botanica, xxvi. Heft 106. Pp. 83, 6 plates, 6 maps and 6 text figs. Stuttgart, 1932.

†By Forrest Shreve, Desert Laboratory of the Carnegie Institution of Washington, Tucson, Arizona. Baltimore, The Williams & Wilkins Co., 1931, pp. ix+195, figs. 43. Price 16*s*.

Printed under the authority of HIS MAJESTY'S STATIONERY OFFICE,
By the South Essex Recorders, Ltd., High Road, Ilford.

(760) Wt. 71/28 925 2/33 S.E.R. Ltd. Gp. 9

BULLETIN OF MISCELLANEOUS INFORMATION No. 2 1933
ROYAL BOTANIC GARDENS, KEW

XI—THE FLORA OF MOUNT ELGON.

The somewhat condensed form adopted in the enumeration of plants was dictated by the desire to include both Major Lugard's introduction and the list in a single issue of the Bulletin. It is hoped that the present number will serve as a handy reference book on the Elgon Flora for residents in Kenya and Uganda. A. W. H.

General Introduction.

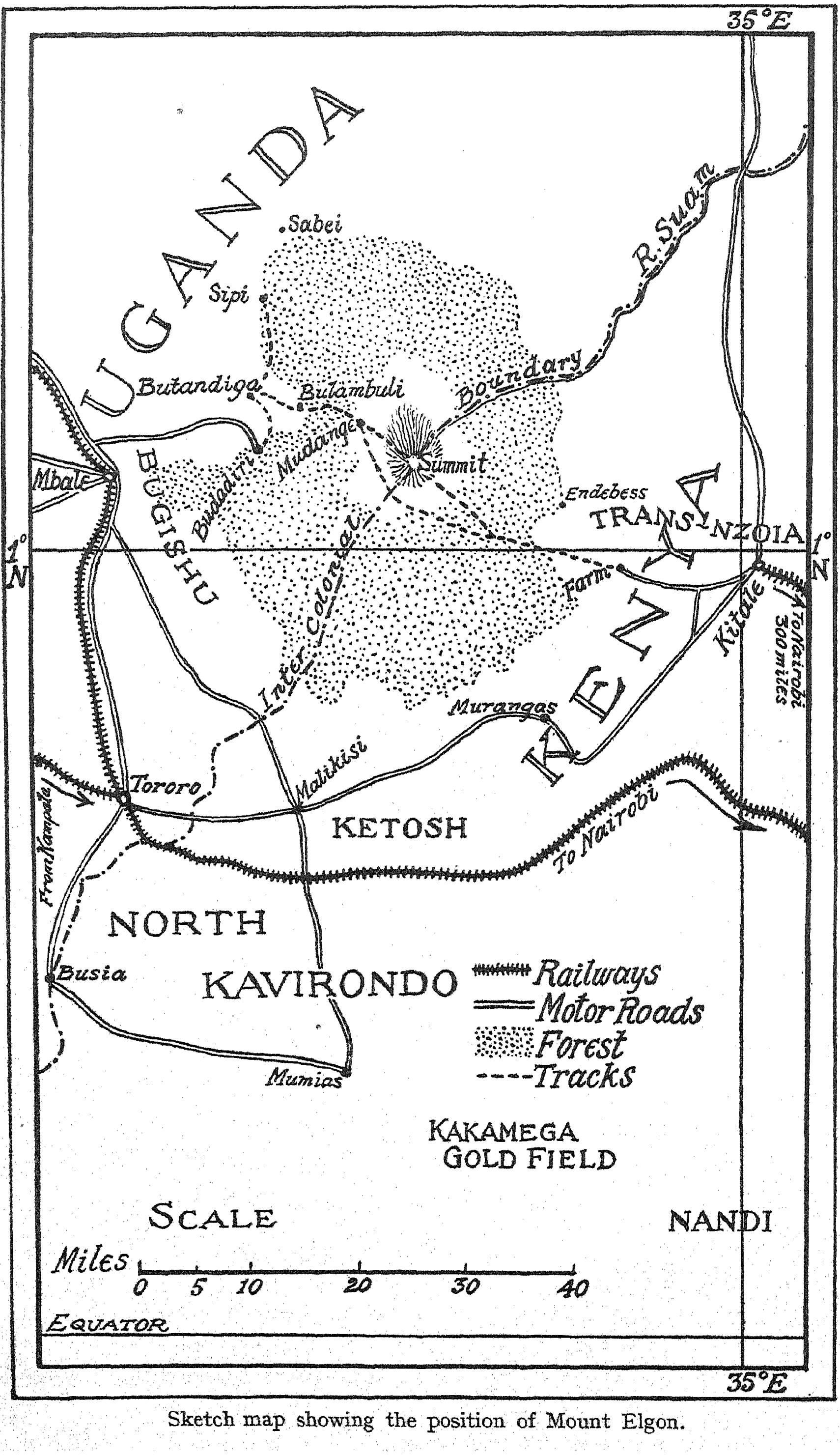
E. J. LUGARD.

The botanical collection (an enumeration of which follows) was made between the months of October, 1930, and May, 1931, by Mrs. Cyril Lugard and myself on the south-eastern (Kenya) slopes of Mt. Elgon, at altitudes varying from 6000 to nearly 14,000 ft. It consists of 649 species, of which 36 (and possibly more) are new or previously undescribed, and includes a small supplementary collection of trees and shrubs by Mr. T. H. E. Jackson, and also a few additional specimens gathered by Mrs. D. R. Tweedie and by my son, Captain Cyril Lugard, and his wife in two recent ascents specially undertaken to collect further material of arborescent Senecios.

With the exception of a few of the beautiful ferns, a remarkable lichen and a club-moss, we confined ourselves to the flowering plants. Coloured drawings of eighty-seven of the species were made by my wife, for which the Royal Horticultural Society was pleased to award her the Silver Grenfell Medal in November, 1931.

Our base was my son's coffee-farm, which is situated 18 miles west of Kitale, on a spur of the mountain at an altitude rising from 6500 to 7200 ft. With such an interesting field as an equatorial mountain, I judged it more useful to concentrate our efforts on a relatively small area than to attempt a desultory collection over such a vast country as Kenya, varying greatly in climate and soil and in altitude from sea-level to snow-level. The collection is, therefore, strictly localized, and, with the exception of a very few specimens gathered within a ten-mile radius, it was made exclusively on the mountain or on the foothills.

The Elgon flora, may, however, be considered to be, in the main, typical of that of the Kenya Highlands at corresponding altitudes.



Sketch map showing the position of Mount Elgon.

The following is a general description of the locality :—

PHYSICAL FEATURES.

Mt. Elgon (also called Masaba or Masawa) lies approximately on the intersection of Lat. 1°N. and Long. 34½°E. Its highest peak is said to be 14,178 ft. and is only surpassed in Central Africa by Kilimanjaro (19,720 ft.), Mt. Kenya (17,040 ft.), and Ruwenzori (16,794 ft.). But her taller sisters are all snow-capped, while the summit of Mt. Elgon just fails to reach the line of perpetual snow (15,500 to 16,000 ft., according to aspect), and is therefore rarely snow-covered, and, even then, the snow seldom lasts for more than a few hours. Dummer, however, records that a three-inch fall of snow impeded his progress considerably (2).*

Although Mt. Elgon has to-day no ice-cap, it has a series of three old moraines, the remains of the Pluvial period when the snow and glacier level descended to the 10,000 ft. contour (15).

Mt. Elgon is perhaps the largest extinct volcano in the world, the crater measuring eight miles in diameter and said to be 1500 to 2000 feet in depth. In the latest survey three peaks are said to be over 14,000 ft. The crest of the massif forms the boundary between Kenya and Uganda ; its base is about 150 miles in circumference. The lower slopes are somewhat precipitous on the north, west and south ; Johnston describes "the tremendous buttresses and precipitous cliffs of gleaming granite or quartz or dark basalt" (14). On the east the spurs fall more gradually to the Trans Nzoia plain. Steep spurs separated by narrow ravines run out from the mountain ; these ravines are traversed by a great number of streams which flow north-west and west through Lake Kioga to the Nile, and south and south-east to the Victoria Nyanza, while on the north-east the Suam River rises in the crater, out of which it cuts its way through a magnificent gorge, and, with many tributary streams, forms the Turkwell River flowing into Lake Rudolf. The ascent of the mountain involves no mountaineering skill ; anyone sound in heart and limb can ascend to the summit, though the last few hundred feet involve some scrambling among precipices and imposing rock-pinnacles. Dummer's companion, MacLennan, suffered, however, so acutely from mountain-sickness that he "wished to lie down and die !" (2). The rarefied air at 13,000 to 14,000 ft., with a cutting east wind and the fierce rays of the equatorial sun, renders the ascent toilsome over the "tussocky" grass (*Festuca abyssinica*) and silver-leafed scrub (*Alchemilla argyrophylla*) of the mountain meadows even in the dry season, while during most of the year the meadows are a bog ! It is too hot to rest in the sun, and too cold to rest in the shade. It would seem that few attempt the ascent, for, on the peak which I climbed, I found records of only 28 names in the last 14 years.

Mt. Elgon was first sighted in the distance by Stanley in 1875, while sailing on Lake Victoria ; he estimated its height at 7000 ft ! (19).

---

*For references see p. 58.

The real discoverer of Mt. Elgon was Joseph Thomson in 1883, who was the first European to visit the mountain and to describe the caves for which it is famous. From time immemorial these caves have been inhabited by man. They are very extensive and honeycomb the mountain. When first discovered many contained large villages and herds of cattle, with deep lakes of fresh water in their recesses. It has been much debated whether the caves are natural or made by man. Thomson, a trained geologist, was confident that they were of artificial origin. " The caves," he writes, " bore incontestible evidence on the face of them that they had neither a natural nor supernatural origin. They must have been excavated by the hand of man. That was a fact about which there could absolutely be no two opinions." " Looking at everything," he adds, " I can come to but one conclusion, and that is, that in a very remote era some very powerful race, considerably advanced in arts and civilization, excavated these great caves in their search for precious stones or possibly some precious metal. However improbable this theory may seem, it is the only one which suggests itself to me after months of cogitation " (21). Major Powell-Cotton found chisel-marks, and considered the caves " wholly artificial " (16), and others maintain that they have been, and are still being, excavated for rock-salt for cattle.

On the other hand, since they occur in the lava as well as in the conglomerate, later opinion considers them natural—vast blowholes of the extinct volcano. Jackson says " it is difficult to imagine them the work of man " (12) ; Hobley, a geologist, considers them " undoubtedly due to natural causes and excavated by water " (8), and Purvis " has not the least doubt that the caves were originally natural, but have been enlarged " (17). Finally, the late Professor Gregory, whose high reputation as a geologist lends exceptional weight to his opinion, after reviewing the evidence, is inclined to consider that the caves are " ordinary natural caverns, though they may have been artificially enlarged and modified " (6).

They are mostly situated on the southern face at the base of the mountain, but some are found at high altitudes ; my porters sheltered in one at nearly 12,000 ft. Some are still inhabited, but the *Pax Britannica* has induced the natives to live in the open. Fleas and filth do not invite a close inspection of their recesses ; Woodhouse tells of two caves abandoned even by the natives owing to the millions of fleas in them ! (24).

Jackson and Gedge were the first Europeans to reach the summit in 1890. Mt. Elgon is known as Masawa to most of the local inhabitants. The word Elgon appears to be an abbreviation of the Masai name, meaning " the mountain of breasts " (3).

THE CLIMATE.

The lower slopes of the mountain on the eastern (Kenya) side afford a delightful climate for Europeans, whose farms on the foot-hills between 6500 and 7000 ft. grow coffee, maize and wheat—the volcanic soil, locally known as "mountain soil," being especially suitable for coffee. Here, practically on the Equator, it is never too hot and never too cold, and, except perhaps for a few nights in the driest months, one can enjoy a blazing log-fire every evening in the year, and three blankets at night. There are fewer mosquitoes and other insect pests than in England, but against this immunity must be set the painful attentions of the jigger flea !

The gardens, frost-free, grow all the choicest flowers and vegetables of an English garden, as well as those of the sub-tropics, in wild luxuriance for the greater part of the year, "the dull season" being the dry months from December to February. The heaviest rainfall is from April to November, with breaks in June and October, with an average of 45 to 50 inches in the year. At similar altitudes on the western (Uganda) side the climate is moister, with a rainfall of over 60 inches, and the slopes are densely covered with banana-groves. At higher altitudes the rainfall is probably much heavier, but no records have been taken. Frost may be expected at night above 10,000 ft., while on the mountain meadows, from 12,000 ft. upwards, the bitter wind and the rarefied air are very trying by day, and the cold at night is intense. Two of Jackson's porters perished from cold when he crossed the summit in 1890 (12).

THE NATIVES.

The natives to the south and west of the mountain belong to the Bantu (Kavirondo) group ; Johnston describes a remarkable concentration of Bantu-speaking tribes on the western flanks, clans of the Bagishu, who speak the most archaic forms of the Bantu language, which "may perhaps claim to be the nearest living approach to the original Bantu mother-tongue" (14). They are among the lowest of East African tribes, and, until recently, practised cannibalism. Johnston adds that "the resemblance of the dwarf types in West Elgon to the Congo Pygmies is unquestionable" (14). South of Mount Elgon lies the Ketosh Reserve, and of the many small tribes living on the foothills to the south and west described by Hobley (8), some are an offshoot of the Ketosh, some are of Kavirondo stock, and others are allied to the Nandi (9). The eastern foothills, now occupied by European farms, were devoid of inhabitants, save for wandering parties of hunters, when Hobley traversed the area in 1896 (8). A tribe locally known as the Elgon Masai, who are entirely pastoral and never cultivate the soil, have villages of rectangular, flat-roofed huts at altitudes of over 10,000 ft., and graze their cattle on the mountain meadows. They are, perhaps, a remnant of the Uasin-gishu Masai who, after their defeat by the Masai of the Rift Valley many generations ago, were "scattered in all directions in small lots, and formed colonies by themselves" (12).

THE FAUNA.

Mammals. The mammals of Mt. Elgon are discussed in detail by Dr. Granvik (5). Of the larger mammals still found on or close to the mountain, elephant are in large numbers and do much damage to crops on the lower slopes ; lion had raided the cattle at Sangula's Village (10,000 ft.) just before my visit. Buffalo, leopard and cheetah are common, and giraffe are still found in the neighbourhood, but the rhinoceros is now thought to be extinct on the mountain. Of the larger antelope, the local species of waterbuck (*Kobus defassa Nzoiae*), Roan, and Jackson's hartebeest are plentiful, as also are bushbuck and reedbuck. Of the smaller antelope, oribi, steinbuck and duiker are very numerous; the last-named nightly raid the gardens, having, it would seem, developed an especial taste for strawberry plants and rose bushes. The small "green" monkey (*Cercopithecus aethiops centralis*) does much damage to the maize crop; the Colobus (*Colobus polykomos matschiei*) and the "blue" monkey (*Cercopithecus leucampyx stuhlmanni*) are also common on the mountain. My porters secured a hare at about 12,000 ft. Some interesting mammals, including a new mole discovered by Foster, have been described recently.

Birds. Below 8000 ft., especially on the foot-hills, there is a great variety of bird life. Of game birds, there are at least five species of francolin, including the rare Elgon Francolin (*Francolinus shelleyi elgonensis*) ; some species are found even up to an altitude of 13,500 ft. There are many species of pigeons and doves, including the handsome Speckled Pigeon (*Columba guinea*), of which there is an illustration in Johnston's book (14). Ellenbeck's Decorated Sand-Grouse (*Pterocles decoratus ellenbecki*) is found in south Elgon. The Saw-winged Swallows (*Psalidiprocne massaica*) nest in the caves up to 8000 ft. Above that altitude, in the heavy forest or on the mountain meadows, there is very little bird life. Jackson says a little Chat (*Pinarochroa hypospodia*), a warbler (*Cisticola hunteri masaba*), both confined to the high alpine zone, and a Sunbird (*Nectarinia*) were the only birds he encountered (12). Dr. Granvik found the Ethiopian Snipe (*Capella nigripennis*) at 13,000 ft., and the Black Duck (*Anas sparsa*) on the icy-cold crater-lakes at 13,800 ft. ! (13).

A list of the birds found in West Elgon and district has been published by Dr. van Someren (23). Colonel H. F. Stoneham has given me the following list of birds as typical of Elgon and the surrounding district :—

Ligony's Grass Warbler	(*Cisticola hunteri masaba*).
Grey-chin Sunbird	(*Anthreptes tephrolaema elgonensis*).
Square-tailed Drongo	(*Dicrurus ludwigii elgonensis*).
Golden-breasted Eremomela	(*Eremomela pusilla elgonensis*).
Elgon Francolin	(*Francolinus shelleyi elgonensis*).
Oriole-Finch	(*Linurgus kilimensis elgonensis*).
Chestnut-winged Starling	(*Onychognathus walleri elgonensis*).
White-starred Bush-Robin	(*Pogonocichla stellata elgonensis*).
Yellow-billed Barbet	(*Trachylaemus purpuratus elgonensis*).

Insects. On the western slopes the tropical forests extend up to about 6000 ft. and abound in insect life. Above that altitude a gradual change to that typical of the higher forests—which becomes more marked at 8000 to 9000 ft.—is observable.

Seven species of mosquitoes have so far been recorded, including, at 6000 to 7000 ft., some which are not found in tropical Uganda. *Anopheles kingi* appears to be a mountain species restricted to a cool climate, since it was originally described from the Livingstone Mountains in the south-west of Tanganyika. *Culex hancocki*, the interesting larvae of which have been described by Hopkins (10), is met with at 9000 ft. in bamboos which have been bored by caterpillars. Many of the smaller forms of life in the higher zones have been the object of study by the Swedish Elgon Expedition (18), to which the researches of Hancock and Soundy have contributed further data (7). The many species of weevils are of particular interest, and include some found on giant-groundsel. An undescribed longicorn has been found in logs of tree-heath. Uvarov (22) has described a grasshopper with short wings—a character not uncommon among species from high mountains—and various species of saw-flies have been found at these higher altitudes. Some interesting forms of minute aquatic life occur in the tarns, including a water mite. The water fleas show some affinity with those of Abyssinia and South Africa. A great variety of lepidoptera is to be found in the foothills, but at altitudes of 11,000 ft. and upwards Sir F. Jackson found but few butterflies on the mountain meadows, and those only in sheltered and sunny spots, including the small fritillary (*Argynnis hanningtoni*), the ubiquitous Painted Lady (*Pyrameis cardui*) and a very small new " blue " (*Cupido aequatorialis*) (12). Mr. T. H. E. Jackson recently captured the latter and also *Zizera stellatus* at nearly 14,000 ft. Among butterflies peculiar to the district Colonel Stoneham mentions *Teracolus elgonensis* and *Belenois victoria dixeyi*. Bryk named a melanistic variety of *Papilio mackinnoni* as *elgonia*.

THE FLORA.

The flora of Mt. Elgon has been much explored. The first collection to reach Kew was that of J. D. Snowden in 1916, and R. A. Dummer in 1918 made a considerable collection, 35 per cent. of which were Cryptogams, mostly mosses and lichens (2). Important papers on the flora have been published by the distinguished brothers, Professors Robert and Thore Fries. More recently, Messrs. Gardner, Hancock, Soundy, and Honoré have made valuable collections, which include a striking, gladiolus-like plant of a new genus, *Oenostachys dichroa*.

The flora is fairly typical of the Equatorial mountains of East and Central Africa. Broadly speaking, we may recognize three " zones of vegetation," which, however, merge into one another and vary much in altitude according to aspect :—

(*a*) *The Sub-montane zone*, from 6000 to 7500 ft.
(*b*) *The Mountain Forest zone*, from 7500 to 10,300 ft.
(*c*) *The Alpine zone*, from 10,300 to 14,000 ft.

Dummer, however, considers that " phytogeographically Elgon falls into six zones " (2), while the great German botanists, Engler and Volkens, distinguish four or five zones or " regions " in describing Kilimanjaro.

(*a*) THE SUB-MONTANE ZONE. On the lower slopes and foothills from 6000 to 7500 ft. the country is open and " park-like," with scattered trees and grass-lands, much of which is now under cultivation. The most numerous trees are various species of *Acacia*, especially the flat-topped *A. abyssinica* which reaches a height of 30 feet. The banks of the streams, however, are generally fringed with heavy sub-tropical forest, in which are found the wild " Nandi coffee " (*Coffea eugenioides*) remarkable for its low percentage of caffeine (11), and the wild banana, the fruit of which is not edible. Of the great variety of beautiful flowers to be found at these lower altitudes, I may mention the gorgeous *Gloriosa virescens*; the brilliant scarlet *Haemanthus multiflorus*; two "Crinum lilies" (*C. Kirkii* and a new species *C. heterostylum*); the scarlet gladiolus (*G. Quartinianus*) which varies greatly in colour at different altitudes from 6000 to 11,000 ft.; three very striking species of " Arum lilies" (*Araceae*); countless thousands of the delightful little "iris" (*Morea Thomsoni*); many species of orchids, mostly terrestrial; a large white pelargonium (*P. multibracteatum*), in leaf and size of flower closely resembling the scarlet " geranium " of English gardens; a magnificent white balsam (*Impatiens elegantissima*); several showy species of *Pentas*; the tall blue-green delphinium (*D. macrocentron*) extending from 6000 to 12,000 ft. and becoming bluer as the altitude increases, a characteristic of the " forget-me-not "; many striking composites, especially *Coreopsis coriacea*; a large number of beautiful Hibiscus, and endless species of the pea family. There are many handsome flowering shrubs, including the beautiful blue *Clerodendron ugandense*, and two species of *Acanthus*—the fine blue *A. eminens*, growing only in dense forest-shade, and the pink *A. pubescens* which is found only in open country. There are many species of St. John's Wort (*Hypericum* spp.), from tiny trailing plants (*H. peplidifolium*) to trees 20 feet in height with flowers two inches in diameter (*H. lanceolatum*). Many brilliantly coloured parasites (*Loranthus* spp.) grow on the trees, some of enormous size which often destroy their host. Of the trees the *Acacia*, the *Dombeya* and, above all, the brilliant scarlet *Erythrina tomentosa* make a great display in their season. The flora on the western (Uganda) slopes at the lower altitudes, where the rainfall is greater and the climate moister, is of a more tropical character, and to some extent approximates to that of West Africa (14).

(*b*) THE MOUNTAIN FOREST ZONE, which includes the bamboo belt and grass glades. This zone may be said to extend roughly from 7500 to 10,300 ft., but varies greatly. The most valuable timber is " podo " (*Podocarpus milanjianus* and *P. gracilior*), used throughout the country by Europeans as a substitute for deal, and the "pencil-cedar" (*Juniperus procera*); I camped under specimens of the latter measuring 20 ft. in girth and over 100 ft. in height. The "podo" are of great size, growing to 80 ft. in height with a girth of 25 ft. Many of the trees are festooned with streamers of lichen (*Usnea longissima*) over 3 ft. in length. Bamboo (*Arundinaria alpina*) occurs in extensive belts between 8000 and 9000 ft., but not as "pure forest" as on Mt. Kenya. Of the scores of species of bamboo growing all over the world in tropical and semi-tropical regions, it is remarkable that this is the only species found on the Equatorial mountains of East Africa. The common bracken (*Pteridium aquilinum*), though found as low as 6500 ft., grows most freely between 8000 and 9000 ft.

(*c*) THE ALPINE ZONE, 10,300 to 14,000 ft., known as the "mountain meadows." It is mostly in this zone that we meet with the giant forms of many plants which in most countries attain only a low growth, e.g., tree-groundsels, tree-heaths, giant lobelias, and tree-hypericums. The only forest trees in this zone are the handsome *Hagenia abyssinica*, growing to 30 feet and carrying a remarkable rosy-pink plume-flower, and the tree-heath (*Erica arborea*), of which the finest specimen that I saw was some 20 feet in height and measured 11½ ft. in girth. From 11,000 to 14,000 ft. those extraordinarily interesting plants, the tree-groundsels (arborescent *Senecio* spp.) are found. They grow to the size of apple-trees, and only occur on the Equatorial African mountains. The species peculiar to Mt. Elgon have been fully described recently in an article by Mr. A. D. Cotton (1).

The many species of *Lobelia*, found from 6000 to nearly 14,000 ft., vary from *L. Giberroa*, which grows to a height of 30 ft. with a flower spike of 6 ft., to *L. Lindblomii*, which is no more than half an inch in height. The giant lobelias are also found in South India, Hawaii, and South America.

A large number of beautiful flowers are to be found on these mountain meadows; acres of "everlastings" (*Helichrysum*) of many species which vary in height from nine inches to ten feet, and in colour from white or yellow to pink and terra-cotta; masses of "red-hot pokers" (*Kniphofia Snowdenii*); "wand-flowers" (*Dierama vagum*); a delightful little crocus-like plant (*Romulea ramiflora*) and two beautiful little Swertias (*S. uniflora* and *S. Lugardae*), which would be well worth introducing to English rock gardens. The sheets of colour, however, are not comparable with those of the alpine meadows of Europe.

I am very greatly indebted to Mr. A. A. Bullock and other members of the Staff of the Kew Herbarium for the trouble they have taken in determining the specimens; to Mr. Juxon Barton of the Kenya Secretariat, to Mr. G. L. R. Hancock of the Uganda Agricultural Department, to Colonel H. F. Stoneham of the Stoneham Museum, Kitale, and to Mr. T. H. E. Jackson of Kapretwa, Kitale, for much valuable information and help.

The following authorities have been freely consulted :—

1. Cotton, A. D., " The Arborescent Senecios of Mount Elgon." *Kew Bulletin*, 1932, 465.
2. Dummer, R. A., " The Vegetation of the Crater and Summit of Mt. Elgon." *Gard. Chron.* ser. 3, lxv. 123 (1919).
3. Eliot, C., *The East Africa Protectorate*, 64 (1905).
4. Granvik, H., " African Ornithology." *Journ. Ornith.* Leipzig, Jahrg. 71, Sonderheft (1923).
5. Granvik, H., " Mammals from Mt. Elgon." *Acta Univ. Lund*, xxi. no. 3 (1924).
6. Gregory, J. W., *The Rift Valleys and Geology of East Africa*, 223–5 (1921).
7. Hancock, G. L. R., and Soundy, W. W., " Notes on the Fauna and Flora of . . . Mt. Elgon." *Journ. E. Afr. & Uganda Nat. Hist. Soc.* no. 36, 165–183 (1931).
8. Hobley, C. W., " A Journey round Mt. Elgon." *Geogr. Journ.* ix. 178–185 (1897).
9. Hollis, A. C., *The Nandi* (1909).
10. Hopkins, G. H. E., *Bull. Entomol. Res.* (1930).
11. *Imperial Institute Bulletin*, viii. 366 (1910).
12. Jackson, F., *Early Days in East Africa* (1930).
13. Jackson, F., *The Game Birds of Kenya and Uganda* (1926).
14. Johnston, H. H., *The Uganda Protectorate* (1902).
15. Leakey, L. S. B., *East Africa Past and Present*, read before the Royal Geographical Society (October, 1930).
16. Powell-Cotton, P. H. G., *In Unknown Africa*, 280 (1904).
17. Purvis, J. B., *Through Uganda to Mount Elgon*, 267 (1909).
18. " Samml. d. schwed. Elgon Exped. im Jahre 1920." *Arkiv Zool.*, 14 *et seq.* (1921).
19. Stanley, H. M., *Through the Dark Continent*, 175 (1878).
20. Stoneham, H. F., " The Birds of the Trans Nzoia." *The Bataleur*, i & iii (1928, 1931).
21. Thomson, J., *Through Masai Land* (1885).
22. Uvarov, B. P., " A new Alpine Grasshopper from Mt. Elgon." *Ann. Mag. Nat. Hist.* v. 249 (1930).
23. van Someren, V. G. L., " Ornithology of West Elgon and District." *Novit. Zool.*, Tring, xxv. 263–290 (1918).
24. Woodhouse, C. W., " The People on the South-Eastern Slopes of Elgon." *Journ. E. Afr. & Uganda Nat. Hist. Soc.* iii. no. 6, 16 (1913).

Enumeration of Plants.

A. A. Bullock.

Numbers which are not preceded by a collector's name refer to specimens collected by Major E. J., Capt. Cyril, and Mrs. Cyril Lugard. There is only one series of numbers for these three collectors, but, as stated in the general introduction, the great majority of the specimens was collected by Major E. J. and Mrs. Cyril Lugard.

The numbers referring to specimens collected by Mr. Jackson and Mrs. Tweedie are preceded by the name of the collector.

Notes on the distribution of the species are necessarily brief, owing to the condensed form of the enumeration, and some explanation is called for. The term " East Africa " in this list includes Eritrea, Somaliland, Abyssinia, Kenya Colony, Uganda Protectorate, and the Mandated Territory of Tanganyika. " Kenya " as distinct from " Kenya Colony " indicates that Mt. Kenya only is referred to. The vast majority of the species are montane in distribution, and the names of the mountains on which they are known to occur are usually written out in full. The short descriptive phrase following each species is based on Major Lugard's field notes.

Space does not permit a phytogeographical analysis, and since not more than two-thirds of the plants known from the mountain are included, this is scarcely desirable.

The 36 new or previously undescribed species, together with 5 new nomenclatural combinations, have been published in two previous papers in the Bulletin (*K.B.* 1932, 465, 487), and are indicated in the following enumeration by asterisks.

In addition to the acknowledgments for advice and assistance in the previous paper, the writer is indebted to Mr. G. Taylor of the British Museum (Natural History) for assistance in naming the Labiatae.

The following groups have been named by other members of the Kew Staff: Pteridophyta (Mr. F. Ballard), Orchidaceae (Mr. V. S. Summerhayes), Cyperaceae (Mr. E. Milne-Redhead), and Gramineae (Mr. C. E. Hubbard).

The arrangement of families follows the system proposed by Mr. J. Hutchinson in his book " Families of Flowering Plants," the second volume of which is shortly to be published.

PTERIDOPHYTA. (F. Ballard.)

Filices.

Polypodiaceae.

Polystichum.—*P. aculeatum* (Linn.) Schott; about 4 ft., no. 339; cosmopolitan. *P. aculeatum* var. *stenophyllon* R. Bon.; 13,000 ft., no. 687; Kenya Colony.

Nephrolepis.—*N. cordifolia* Presl; 6200 ft., erect to 4 ft., no. 285; tropics of the Old World and Australasia.

Asplenium.—*A. adiantum-nigrum* Linn.; 12,600 ft., about 1 ft., no. 335; high altitudes in Tropical and South Africa, and in Europe, Asia, Hawaiian Is. *A. anisophyllum* Kunze; erect to 2 ft., no. 309; Tropical Africa and America. *A. brachypteron* Kunze; 6500–7000 ft., erect, 9 in., no. 296; Tropical Africa. *A. monanthes* Linn.; erect to 14 in., no. 310a; Tropical and South Africa, Atlantic Is., Tropical America, Hawaii. *A. praemorsum* Sw.; 6500 and 13,000 ft., viscid, erect to 9 in., nos. 225; 688; tropics and subtropics of both hemispheres. *A. theciferum* Mett.; 6500 ft., erect to 9 in., no. 227; Tropical and South Africa and South Tropical America. *A. abyssinicum* Fée; to 18 in. high, no. 354; East Africa, Cameroons Mt., Fernando Po, and in Nyasaland.

Pellaea.—*P. hastata* (Thunb.) Prantl; 6500 ft., alongside rocks, erect to 14 in., no. 226; Tropical and South Africa, Himalaya. *P. quadripinnata* (Forsk.) Prantl; 8550 ft., about 4 ft., no. 340; Tropical and South Africa.

Cheilanthes.—*C. farinosa* (Forsk.) Kef.; 6500–7000 ft., erect, 15 in., no. 295; tropics of the Old World.

Adiantum.—*A. aethiopicum* Linn.; 6500 ft., erect to 3 ft., no. 221; Tropical and South Africa, Australasia.

Pteris.—*P. cretica* Linn.; 6500 ft., erect to 2½ ft., no. 224; tropics of the Old World and Polynesia, and in the Mediterranean Region. *P. quadriaurita* Retz.; 6500 ft., erect to 15 in., or up to 4–5 ft., nos. 222; 223; tropics and subtropics of both hemispheres.

Pteridium.—*P. aquilinum* (Linn.) Kuhn; 6500–9000 ft., erect to 5 ft., no. 478; temperate and tropical regions of both hemispheres.

Polypodium.—*P. excavatum* Bory; 6500 ft., epiphytic on trees, erect to 11 in., no. 228; Tropical Africa, Himalaya, Japan.

Lycopodiales.

Lycopodiaceae.

Lycopodium.—*L. Saururus* Lam.; 13,000 ft., in marsh, no. 690; Tropical and South Africa, Atlantic Is., Mascarene Is., Tropical South America, Kerguellen's Is., Marion Is.

GYMNOSPERMAE.

Cupressaceae.

Juniperus.—*J. procera* (Carr.) Hochst. ex A. Rich; 9000–10,200 ft., a timber tree to 120 ft. (girth 20 ft.), nos. 408 (mature); 408a (juvenile); East Africa, and probably also in Arabia.

Podocarpaceae.

Podocarpus.—*P. milanjianus* Rendle; 7500 ft., tree 100 ft., leaves up to 6 in. long, fruit (receptacle) red, no. 694 (♂ & ♀); Uganda and Kenya Colony, and southwards to Nyasaland and Gazaland. *P. gracilior* Pilger; 7000–9000 ft., tree 100 ft. or more, girth 25 ft., leaves up to 2 in. long (usually less), fruit (receptacle obsolete) dark green to black, nos. 64 (♀); 64a (♂); Jackson 352a (♀); Abyssinia and Somaliland, Uganda, Kenya Colony and Tanganyika.

ANGIOSPERMAE.

I.—*Dicotyledones.*

Ranunculaceae.†

Thalictrum.—*T. rhynchocarpum* Dill. et A. Rich.; 6000 ft., slender herb to 7 ft., flowers cream, growing in shady or swampy places, no. 660; Abyssinia southwards to the Transvaal and Natal, and westwards to Ruwenzori and Virunga Mts.

Clematis.—*C. inciso-dentata* A. Rich.; 6500–7500 ft., climber, flowers creamy, no. 65; East Africa, Sudan.

Anemone.—*A. Thompsoni* Oliv., 11,000–12,300 ft., herb 1 ft., flowers white, underside purplish, No. 305; Abyssinia, Aberdares, Kilimanjaro, Hanang.

Ranunculus.—*R. pubescens* Thunb.; 6500–7500 ft., erect herb, 2 ft., flowers yellow, nos. 165; 347; widely spread in East Africa, southwards to South Africa, and on the Bauchi Plateau. *R. oreophytus* Del.; 11,600 ft., rosette herb, flowers yellow, no. 363; East African Mts., southwards to the Livingstone Mts., Virunga Mts.

Delphinium.—*D. macrocentron* Oliv.; 6000–12,000 ft.; erect to 6 ft., flowers greenish-blue, becoming more definitely blue with increasing altitude, no. 26; general at high altitudes in Kenya Colony.

Menispermaceae.

Tinospora.—*T. Bakis* (A. Rich.) Miers; 6500 ft., twiner, flower yellowish-green, no. 593; Senegambia eastwards to Abyssinia and Uganda.

Cissampelos.—*C. Pareira* Linn.; 6500 ft., twiner, flowers green, fruits orange, no. 497 (♀); 658 (♂); tropics and subtropics of both hemispheres.

Stephania.—*S. cyanantha* Welw. ex. Hiern; 6500 ft., twiner, flowers dull mauve, fruits scarlet, nos. 502; 502a; Angola. *S. abyssinica* (Dill. et A. Rich.) Walp.; 8500 ft., twiner, flowers green, no. 493; Tropical Africa generally, and South Africa. *S. praelata* Miers; 6500–7500 ft., creeper, flowers green, no. 447; East and South Africa.

Piperaceae.

Peperomia.—*P. reflexa* (Linn.) Dietr.; 6500 ft., epiphyte, flowers green, no. 520; widely distributed in warm regions. *P. rungwensis* Engl., 6800 ft., creeper on rock, spikes white, no. 637; Kenya, Livingstone Mts.

Capparidaceae.

Cleome.—*C. monophylla* Linn.; 6500 ft., erect to 1 ft., flowers pale pink, no. 588; Tropical and subtropical Africa generally.

---

†Of this family, *Ranunculus elgonensis* Ulbr. occurs also at 13,000 ft., and *Clematopsis Oliveri* Hutch. at about 5000 ft.

Gynandropsis.—*G. gynandra* (Linn.) Briq.; 7200 ft., erect to 1 ft., flowers pink, uncommon, no. 598; a tropical weed of cultivation and waste places.

Ritchiea.—*R. Albersii* Gilg; 6500–7500 ft., shrub 20–30 ft., flowers white and green, pleasantly scented, Jackson no. 321 ("Samisiet"); Kenya Colony and Uganda.

Cruciferae.

Rorippa.—*R. indica* (Linn.) L. H. Bailey; 11,700 ft., herb 2 ft., flowers yellow, nos. 393; 419; East Africa eastwards to India.

Arabis.—*A. alpina* Linn.; 11,700–13,500 ft., erect, 1 ft. flowers white, no. 361; North Temperate and subarctic regions, and the high mountains of East Africa.

Cardamine.—*C. obliqua* Hochst. ex A. Rich.; 10,850 ft., erect to 1 ft., flowers pale mauve, no. 355; Abyssinia, Kenya, Aberdares, Ruwenzori, Virunga Mts. *C. Johnstoni* Oliv.; 11,500–12,500 ft., in or near wet places, erect herb with rosy purple to white flowers, Tweedie B30; Kenya, Kilimanjaro, Virunga Mts.

Arabidopsis.—*A. Thaliana* (Linn.) Schur.; 11,700 ft., spreading, 4 in., flowers white, no. 362; N. Temperate regions, Abyssinia, Kilimanjaro, South Africa.

Violaceae.

Viola.—*V. abyssinica* Steud.; 7000 ft., spreading, 1 ft., flowers mauve, no. 251; East Africa southwards to Nyasaland, S. Rhodesia and the Transvaal, and westwards to Cameroons Mt. and Fernando Po. *V. Eminii* (Engl.) R. E. Fries; 8600–11,100 ft., spreading, 1 ft., flowers violet, nos. 251a, 375; Kenya, Aberdares, Kilimanjaro, Shira, Uluguru, Ruwenzori, Virunga Mts.

Polygalaceae.

Polygala.—*P. ukirensis* Gürke; 6100 ft., found in one swamp only, erect to 4 ft., flowers yellow, no. 20; Ukira, Buddu. *P. Quartiniana* A. Rich.; 8000–9000 ft., creeper to 8 ft., flowers mauvy pink, nos. 36, 477; East Africa. *P. Quartiniana* var. *minor* Chod.; 6500–8000 ft., spreading, 8–12 in., flowers purple and white, nos. 50; 171; 357; Abyssinia, Kenya Colony. *P. albida* Schinz; 6500–7500 ft., erect to 3 in., flowers green, no. 12; Kilimanjaro southwards to southern Tropical Africa. *P. Volkensii* Gürke; 6700 ft., erect to 2 ft., flowers greenish-yellow, no. 458; Kenya Colony, Uganda and Tanganyika generally, extending to Nyasaland and Rhodesia, and N. Nigeria and Dahomey.

Crassulaceae.

Crassula.—*C. aquatica* (Linn.) Schoenl., 13,600 ft., creeping bog plant, flowers magenta, no. 330; Europe, East Africa. *C. Wrightiana* Bullock*; 6500–7500 ft., in swamps, erect, 3 in. to 1 ft., flowers white with purple centre, nos. 215 ; 538 ; Kenya, Aberdares, Mau, westwards to Behungi swamp (Virunga Mts.) and Arusha, Tanganyika. *C. erubescens* Bullock*; 8250 ft., a rock plant, 2 in., with bright scarlet foliage and cream flowers, no. 422.

Kalanchoe.—*K. crenata* Haw. ; 6500–7500 ft., succulent herb to 5 ft., inflorescence and flowers viscid-hairy, flowers deep salmon-coloured, no. 114 ; widely distributed in Tropical Africa. *K. Lugardii* Bullock* ; 6500–7500 ft., erect succulent glabrous herb to 5 ft., flowers pale yellow, no. 115 ; probably also in Tanganyika. *K. Petitiana* A. Rich. ; 9500 ft., and at lower altitudes, succulent herb 4–5 ft., inflorescence and flowers similar to those of *K. crenata*, but glabrous, Tweedie 116 ; Abyssinia and Kenya Colony, westwards to Cameroons Mt.

Umbilicus.—*U. botryoides* Hochst. ex A. Rich. ; 8000–11,800 ft., on rocks, herb 7 in. to 1 ft., flowers greenish-yellow, nos. 86 ; 418 ; Abyssinia, Sudan, Ruwenzori and Cameroons Mt.

Sedum.—*S. ruwenzoriense* E. G. Baker ; 10,200–11,700 ft., on rocks, flowers yellow, no. 423 ; Kenya, Ruwenzori.

Caryophyllaceae†.

Silene.—*S. chirensis* A. Rich. ; 11,700 ft., erect to 15 in., flowers white and pinky-mauve, no. 413 ; Abyssinia, Somaliland, Aberdares, and probably widely distributed in East Africa.

Cerastium.—*C. afromontanum* Th. Fries jr. et H. Weim. ; 11,700–11,800 ft., straggling, sticky herb, flowers white, nos. 324 ; 489 ; Kenya, Aberdares.

Portulacaceae.

Portulaca.—*P. quadrifida* Linn. ; 6600 ft., herb creeping over rocks, flowers yellow, no. 644 ; widely distributed in warm regions.

Polygonaceae.

Oxygonum.—*O. atriplicifolium* (Meisn.) Martelli ; 6900 ft., on rock, erect to 4 in., flowers pink, no. 651 ; East Africa and southern Tropical Africa generally.

Polygonum.—*P. serrulatum* Lag. ; 6300 ft., near water, erect to 30 in., racemes drooping, flowers pink, no. 589 ; East Africa and westwards to Senegambia. *P. acuminatum* H. B. et K.; 6500–7500 ft., erect to 3 ft., flowers pinky-white, no. 164 ; Tropical and South Africa generally, and tropical America.

Rumex.—*R. nepalensis* Spreng. ; 8500 ft., erect to 4 ft., flowers russet, no. 266 ; Tropical Africa generally, and in tropical Asia.

---

†The moss-like submerged aquatic *Tristicha hypnoides* Spreng., of the family Podostemaceae occurs in streams and rivulets, particularly below waterfalls (*Soundy & Hancock* no. 11a in Herb. Kew.).

R. afromontanus Th. Fries jr.; 11,700 ft., erect to 7 ft., flowers yellowish green, no. 428; Kenya, Ruwenzori, Virunga Mts.†

Phytolaccaceae.

Phytolacca.—*P. dodecandra* L'Hérit.; 6500 ft., giant creeper climbing to 30 ft., flowers green, fruit orange-red, nos. 512; 512a; Tropical Africa generally, and in tropical America and Asia.

Chenopodiaceae.

Chenopodium.—*C. murale* Linn.; 6500–7500 ft., spreading, to 1 ft., flowers reddish-green, no. 272; East Africa, Sudan, Angola, and S. W. Africa, extending to Socotra, and widely distributed as a weed.

Amarantaceae.

Amaranthus.—*A. tricolor* Linn.; 6700 ft., spreading, to 2 ft., stems purplish, flowers green, no. 638 ("Wild Spinach"); widely distributed as a weed, and also cultivated.

Cyathula.—*C. globulifera* Moq.; 6500–7500 ft., erect to 10 ft.; flowers green, no. 137; East Africa, Nyasaland, Rhodesia.

Achyranthes.—*A. aspera* Linn.,; 6500–7500 ft., erect to 6 ft., flowers pink, no. 166; widely distributed in the warm regions of the Old World.

Linaceae.

Linum.—*L. gallicum* Linn. var. *abyssinicum* (Hochst.) Planch.; 8000 ft.; erect to 3 ft., flowers yellow, no. 248; East Africa, Virunga Mts.

Geraniaceae.

Monsonia.—*M. biflora* DC.; 6500–7500 ft., spreading, to 1 ft., flowers white, no. 169; East Africa, Rhodesia, Angola and South Africa.

Geranium.—*G. aculeolatum* Oliv.; 7000–8000 ft., erect to 2 ft., or scrambling to 4 ft., stem armed with prickles, flowers white, nos. 56; 243; East Africa southwards to Nyasaland. *G. simense* Hochst. ex A. Rich.; 8000 ft., erect to 3 ft., flowers deep pink, no. 260; East Africa southwards to Nyasaland, and westwards to Cameroons Mt. and Fernando Po, extending to Arabia and Madagascar. *G. vagans* Baker; 10,850 ft., erect to 1 ft., flowers white, no. 356; Kilimanjaro, Shira, Nyika Plateau. *G. kilimanscharicum* Engl.; 11,000–11,800 ft., creeping plant, 2 in., flowers mauve- or magenta-pink, nos. 328; 411; Aberdares, Kilimanjaro, Shira.

Pelargonium.—*P. multibracteatum* Hochst. ex A. Rich.; 7000 ft., spreading, 2 ft., flowers pure white, no. 267; East Africa southwards to Usambara.

---

†A further interesting plant, *Harpagocarpus Snowdenii* Hutch. et Dandy, occurs at 6000–7000 ft.

Oxalidaceae.

Oxalis.—*O. corniculata* Linn.; 6500–7500 ft., creeping, flowers yellow, no. 254; widely distributed in warm regions. *O. corniculata* var. *repens* (Thunb.) Zucc.; 13,600 ft., creeping, flowers yellow, no. 331; widely distributed. *O. purpurata* Jacq. var. *anthelmintica* (A. Rich.) Knuth; 6500–7500 ft. (and also at lower levels, where the growth is more robust), erect to 7 in., flowers purple, pale mauve, or white, nos. 104; 624; East Africa. *O. obliquifolia* Steud. ex A. Rich.; 6900–11,000 ft., erect, 2–6 in., flowers mauve or pink, nos. 476; 650; East Africa, Nyasaland, Angola, Natal and West Griqualand.

Balsaminaceae.

Impatiens.—*I. papilionacea* Warb.; 6500–9000 ft., erect, to 5 ft. flowers pink; nos. 51; 194 (partly); Kenya, Aberdares, Kilimanjaro, Nyasaland. *I. Hochstetteri* Warb.; 6500–7500 ft., erect to 5 ft., flowers pink, no. 194 (partly); East Africa. *I. elegantissima* Gilg; 6500–8500 ft., erect to 3 ft., flowers pure white; no. 265; Kenya, Aberdares. *I. phlyctidoceras* Bullock*; 11,700 ft., erect to 3 ft.; flowers scarlet-crimson; no. 313.

Two further species of this genus, both members of Warburg's section *Salpingochilon*, were collected by Mrs. Tweedie in November, 1932, and were received at Kew while this paper was in the press. I have not yet been able to identify them. The notes accompanying them are as follows:—No. A2, " Balsam of great beauty, found in sheltered and shaded places under cliffs and boulders kept wet by drips from the rocks as well as by rain, and still moist when the bogs have dried, at 12,500 ft. and higher." No. A7, " Fine scarlet balsam found in shady spots about the edge of woods at 10,500–11,500 ft., showing a tendency to climb where it finds support." These very probably represent undescribed species, and further herbarium material is very desirable.

Lythraceae.

Ammannia.—*A. aegyptiaca* Willd.; 6400 ft., near water, spreading, 2 ft.; no. 536; Mediterranean region, Orient, India, and Tropical Africa.

Lythrum.—*L. rotundifolium* Hochst. ex A. Rich; 9000–9500 ft., in bogs, spreading, to 1 ft., flowers bright purple or magenta, nos. 321a; 321b; East Africa.

Oliniaceae.

Olinia.—*O. usambarensis* Gilg; 6500–7500 ft., shrub or tree 40–50 ft., flowers white, nos. 202; Jackson 337a; Kenya, Aberdares, Livingstone Mts.

Punicaceae.

Punica.—*P. Granatum* Linn.; 6050 ft., some distance from cultivation, and not now known to be cultivated in the vicinity, shrub to 12 ft., flowers scarlet, no. 300; native in Persia to N. W. India and widely cultivated as the well-known Pomegranate.

Onagraceae.

Ludwigia.—*L. prostrata* Roxb.; 6400 ft., erect herb growing near water, with yellow flowers, no. 535; East and South Tropical Africa, extending to the Mascarene Is., India and eastern Asia.

Epilobium.—*E. hirsutum* Linn.; 6500 ft., near water, erect to 6 ft., flowers crimson, no. 499; widely distributed in the Old World. *E. cordifolium* A. Rich.; 9000 ft., near water, suberect, flowers pale pink, no. 348a; East Africa.

Thymelaeaceae.

Lasiosiphon.—*L. glaucus* Fresen.; 8500 ft., tree to 20 ft., flowers yellow, in heads, no. 382; Abyssinia, Kenya, Aberdares, Kilimanjaro, Nyasaland, Cameroons Mt. *L. lampranthus* Gilg; 6800 ft., shrub 4–10 ft., flowers yellow-orange, in heads, no. 516; Tanganyika (Karagwe) and Uganda (W. Toro, W. Ankole).

Proteaceae.

Protea.—*P.* sp. indet.; 11,800 ft., shrub to 20 ft., flowers cream, no. 402; material insufficient.

Pittosporaceae.

Pittosporum.—*P. abyssinicum* Del.; 6800 ft., shrub 12 ft., seeds scarlet, no. 627; East Africa.

Flacourtiaceae.

Doryalis.—*D. macrocalyx* (Oliv.) Warb.; 6600 ft., shrub to 8 ft., fruits scarlet, no. 577; 648; Kenya Colony, Uganda, and Portuguese East Africa westwards to Angola.

Flacourtia.—*F. Kirkiana* Burtt Davy; 6500–7500 ft., spreading tree to 35 ft.; flowers yellowish-green; nos. 544; 587; Jackson 348; Livingstone Mts., Rhodesia.

Cucurbitaceae.

Trochomeria.—*T. Harmsiana* Bullock*; 6500–7500 ft., creeper, leaves digitately divided into linear segments, flowers green, fruit scarlet, globose, no. 143.

Momordica.—*M. foetida* Schum. et Thonn.; 6500–7500 ft., twining creeper, leaves ovate, deeply cordate at the base, flowers pale yellow or greenish-white, fruit oval, orange coloured, prickly, nos. 98; 448; widely spread in Tropical Africa, extending to Natal.

Coccinia.—*C. adoensis* (Hochst. ex A. Rich.) Cogn.; 6700 ft., twiner, leaves digitately divided into linear toothed segments, pale salmon flowers, fruits orange, no. 542; Abyssinia.

Myrtaceae.

Syzygium.—*S. cordatum* Hochst. ex Sond.; 6500–7500 ft., tree 30–50 ft., flowers white, fruits globose, purple, 1 in. diam., nos. 181;

Jackson 345a ; Kenya and Uganda southwards to Portuguese East Africa and westwards through Nyasaland, Rhodesia and Katanga to Angola.

Melastomaceae.

Dissotis.—*D. macrocarpa* Gilg ; 6500–7000 ft., erect to 3 ft., flowers purple-magenta, no. 230 ; swamps of western Kenya Colony, Uganda and Bukoba. *D. alpestris* Taub. ; 6500–7500 ft., erect, 4 ft., flowers mauve, no. 72 ; Kenya Colony, Uganda, Virunga Mts., Tanganyika and Nyasaland.

Combretaceae.

Combretum.—*C. elgonense* Exell* ; 6100 ft., spreading tree to 20 ft., flowers green, no. 524. *C. Guenzii* Sond. ; 6200 ft., tree to 20 ft., fruit green, winged, no. 286 ; Kenya Colony and Uganda southwards to Natal and westwards through Nyasaland, Rhodesia, and Katanga to Angola and South-west Africa.

Hypericaceae.

Hypericum.—*H. kiboense* Oliv. ; 11,500 ft., flat, spreading habit, to 5 ft., flowers yellow, with red sepals, capsules red, no. 323 ; Kenya, Aberdares, Kilimanjaro. *H. lanceolatum* Lam. ; 8600 ft., tree to 20 ft., flowers golden, no. 472 ; widely distributed on the African mountains, and in Madagascar. *H. Quartinianum* A. Rich. ; 7000 ft., shrub to 8 ft., flowers yellow, no. 59 ; East African highlands southward to Nyasaland. *H. peplidifolium* A. Rich. ; 6500–7500 ft., ground creeper, flowers yellow, no. 205 ; Abyssinia and eastern Sudan, westwards to Cameroons Mt. and southwards to Nyasaland and Rhodesia. *H. afromontanum* Bullock* ; 11,800 ft., perennial herb, stems simple, erect to 18 in., flowers in heads, yellow, striped red, glands black, stalked ; no. 338a.

Tiliaceae.

Grewia.—*G. similis* K. Schum. ; 6500–7500 ft., shrub to 15 ft., flowers mauve, nos. 253 ; 677 ; East Africa generally, and in Rhodesia and Katanga.

Triumfetta.—*T. macrophylla* K. Schum. var. *ruwenzoriensis* Sprague et Hutch. ; 8000 ft., erect to 6 ft., flowers orange-yellow, no. 45 ; the typical form, and its varieties, occurs throughout Uganda, Kenya Colony and Tanganyika.

Sparmannia.—*S. ricinocarpa* (Eckl. et Zeyh.) O. Kuntze ; 9500–11,500 ft., a bushy plant of the forest undergrowth, flowers pink, fruits armed with hooked spines, Tweedie A11 ; widely distributed in eastern Tropical Africa, and in South Africa.

Sterculiaceae.

Dombeya.—*D. Dawei* Sprague ; 6500–7500 ft., shrub to 20 ft., flowers white, nearly 2 in. in diameter, no. 127 ; Victoria Nyanza basin, Kilimanjaro, Virunga Mts. *D. rotundifolia* Harv.; 6500–7500 ft., tree 20–30 ft., flowers pinkish-white, less than 1 in. diameter, corolla persistent, nos. 249; Jackson 335a (" Porowet-at-Ko "); Kenya Colony and Tanganyika southwards to the Cape.

Malvaceae.

Malva.—*M. verticillata* Linn.; 11,800 ft., erect to 2 ft., flowers mauve, no. 487; Abyssinia and Egypt eastwards to India, and now widely spread owing to transportation with seeds, etc.

Sida.—*S. Schimperiana* Hochst. ex A. Rich.; 6600 ft., woody, spreading undershrub to 8 in., leaves small, obcordate, flowers yellow, no. 614; East Africa southwards to Usambara, extending to India. *S. rhombifolia* Linn.; 6500–7500 ft., erect shrub to 5 ft., leaves ovate, acuminate, flowers buff, no. 123; widely spread in the tropics.

Abutilon.—*A. longicuspe* Hochst. ex A. Rich.; 6500–7500 ft., erect to 6 ft., flowers pale purple, no. 162; East Africa. *A. Mauritianum* (G. Don) Sweet; 6500–7500 ft., erect to 8ft., flowers golden, no. 138; widely spread in tropical and subtropical Africa.

Pavonia.—*P. Schimperiana* Hochst. ex A. Rich.; 6500–7500 ft., erect to 7 ft., flowers white, no. 192; East Africa, Mascarene Islands, extending to the Belgian Congo, Cameroons and West Africa. *P. urens* Cav.; 6500–7500 ft., erect, 6–10 ft., flowers pink or purplish-pink, nos. 5; 193; Kenya Colony and Uganda southwards to Nyasaland.

Kosteletzkya.—*K. adoensis* Hochst. ex Walp. var. *hirsuta* Oliv.; 6500–7500 ft., erect to 2 ft., flowers pale purple or cream flushed with purple, and with a purple centre, nos. 161; 178; East Africa westwards to the Cameroons Mt.

Hibiscus.—*H. vitifolius* Linn.; 6700 ft., spreading, to 6 ft., flowers large, primrose-yellow with maroon centre, no. 454; widely spread in the Old World tropics, and in Australia. *H. diversifolius* Jacq.; 6500–7500 ft., shrub to 5 ft., stems prickly, flowers large, lemon-yellow, with deep purple throat and purple flush on the lower surface, nos. 60; 449; Tropical and South Africa, Mascarene Islands and Australia. *H. cannabinus* Linn.; 6500–7500 ft., erect to 6 ft., stems, petioles and calyx prickly, leaves palmately lobed to the base, flowers large, cream with crimson throat, no. 188; widely spread by cultivation in the Old World and subtropical Australia. *H. calyphyllus* Cav.; 6500–7500 ft., erect to 15 ft., not prickly, flowers very large (3 in. long), pale yellow, no. 152; East Africa southwards to South Africa. *H. gossypinus* Thunb.; 6500–7500 ft., erect to 10 ft. stems, calyx, etc., clothed with dark brown stellate hairs, flowers about 1 in. long, pure white, seeds cottony, no. 122; East Africa southwards to Natal and South Africa. *H. aethiopicus*

Linn.; 6100 ft., erect, 3–5 in. flowers about 1 in. long, lemon-yellow, no. 527; widely spread in East Africa and extending to South Africa. *H. aponeurus* Sprague et Hutch.; 6500–7500 ft., erect to 3 ft., flowers less than 1 in. long, scarlet, no. 236; East Africa and the Sudan.

Euphorbiaceae.

Euphorbia.—*E. Euryops* Bullock*; 10,000 ft., stems simple, erect to 2 ft., bracts deep crimson; no. 380. *E. Wellbyi* N.E.Br.; 11,000 ft., stems simple, clustered, erect to 1 ft.; no. 395; also in Abyssinia.† *E. Schimperiana* Scheele; 6500–7500 ft., herb, erect to 5 ft., flowers green, no. 273; Arabia and Abyssinia southwards to Nyasaland and westwards to the Virunga Mts.

Bridelia.—*B. micrantha* Baill.; 6500–7500 ft., spreading tree to 40 ft., flowers green, in axillary clusters, fruits red, nos. 277; Jackson 346a; widely distributed in Tropical and South Africa.

Phyllanthus.—*P. Fischeri* Pax; 8000–10,000 ft., in forest, Tweedie 43; Kenya Colony, Usambara.

Croton.—*C. macrostachys* Hochst. ex A. Rich.; 6700 ft., spreading tree to 30 ft., flowers in racemes, green, practically evergreen, leaves turn orange before falling, no. 642; East Africa generally, and in Nyasaland and Portuguese East Africa, extending westwards through the Belgian Congo to French Guinea.

Cluytia.—*C. abyssinica* Jaub. et Spach.; 6500–7500 ft., shrub to 6 ft., flowers greenish white in axillary clusters, no. 124; eastern Tropical Africa generally. *C. robusta* Pax; 11,800 ft., shrub 4 ft. flowers green, stems tomentose when young, no. 464; Abyssinia, Aberdares, Mau Plateau, Kilimanjaro, and southwards to Gazaland.

Acalypha.—*A. Volkensii* Pax; 6400 ft., spreading to 4 ft., male flowers brick red, in spikes up to 3 in. long, females near the base of the male spike; no. 531; East Africa.

Ricinus.—*R. communis* Linn. (Castor Oil Plant); 6500–7500 ft., near cultivated or formerly cultivated land, erect to 15 ft., male flowers pale yellow, female red, no. 281; throughout Tropical Africa, and widely cultivated in warm and temperate regions.

Rosaceae.

Pygeum.—*P. africanum* Hook. f.; 6500–7500 ft., tree 20–60 ft., flowers yellowish green, fruits dark red, nos. 445; Jackson 349a ("Aramaatet"); widely distributed in eastern Tropical Africa from Kenya and Uganda southwards to Natal, extending westwards to the Cameroons Mt., Gabon and Angola.

---

†The Mt. Elgon material differs somewhat from the Abyssinian plant, in its more obtuse leaves and completely glabrous stems, but I have been unable to establish specific distinction.

Rubus.—*R. Steudneri* Schweinf. ; 8500 ft., spreading, to 6 ft., flowers pink, fruit orange, no. 263 ; Abyssinia, Imatong Mts., Nandi Plateau, Ruwenzori. *R. Volkensii* Engl. ; 8500 ft., near water, erect to 6 ft., flowers creamy white, plant very sticky, no. 304a ; Abyssinia, Kenya, Aberdares, Mau, Kilimanjaro. *R. pinnatus* Willd. ; 6500 ft., creeper to 20 ft., petals absent or very short, fruit orange, no. 509 ; Tropical and South Africa, extending to the Atlantic Is.

Alchemilla.—*A. argyrophylla* Oliv.; 11,500–13,500 ft., shrub to 4 ft., foliage silvery, flowers cream, no. 369 ; Kenya, Aberdares, Kilimanjaro, Shira Mts., and probably also Ruwenzori. *A. Granvikii* Th. Fries, jr. ; 12,800 ft., glabrous, climbing to 3 ft., stems red, flowers green, no. 332a ; Kinangop. *A. Johnstoni* Oliv. ; 13,000 ft., pilose subshrub, Tweedie 82 ; Kilimanjaro, Virunga Mts.

Hagenia.—*H. abyssinica* Willd. ; up to 12,000 ft., a tree to 30 ft., flowers rose pink, in large panicles, no. 430 ; Abyssinia, Kenya, Aberdares (?), Ruwenzori, Virunga Mts., Kilimanjaro, Meru, Livingstone Mts., Nyasaland.

Caesalpiniaceae.

Caesalpinia.—*C. sepiaria* Roxb. ; 6500 ft., spreading shrub to 10 ft., with recurved prickles on stem and leaf rachis, flowers racemose, yellow, filaments bearded, no. 298 ; a semi-naturalised introduction from Tropical Asia.

Pterolobium.—*P. exosum* (Gmel.) E. G. Baker ; 6500–7500 ft., climber to 30 ft., with recurved prickles, flowers dull white, fruits winged, scarlet or brick red, no. 237 ; Abyssinia and southwards to the Transvaal.

Cassia.—*C. didymobotrya* Fresen. ; 6500–7500 ft., shrub 10–15 ft., flowers yellow, pods green to brown, about 4 in. long and ¾ in. broad, nos. 154 ; Jackson 304 ; East Africa westwards through Rhodesia to Angola. *C. mimosoides* Linn. ; 6500–7500 ft., erect, 3–4 ft., flowers yellow, pods about 3 in. long, less than ¼ in. broad, nos. 23 ; 219 ; Tropical Africa generally, and in Asia and Australia. *C. usambarensis* Taub. ; 6500–7500 ft., trailing on ground, petals yellow, sepals terra-cotta, pods about 1 in. long, no. 255a ; Aberdares, Usambara Mts. *C. bicapsularis* Linn. ; 6500–7500 ft., spreading bush to 4 ft., flowers orange-yellow, no. 450 ; a naturalised introduction from Tropical South America and the West Indies, and cultivated all over Africa and Tropical Asia.

Mimosaceae.

Entada.—*E. abyssinica* Steud. ; 6500–7500 ft., in fairly open country, spreading tree 20–30 ft., flowers spicate, yellow, pods green to brown, nos. 600 ; Jackson 341 ; Tropical Africa generally.

Acacia.—*A. Lahai* Steud. et Hochst. ex Benth.; 6500–7500 ft., flat-topped tree to 25 ft., spines straight, in pairs, flowers cream, spicate, nos. 513; Jackson 347a ("Karmetiet"); Abyssinia, Eritrea. *A. abyssinica* Hochst. ex Benth.; 6500–7500 ft., flat-topped, spreading tree to 30–50 ft., flowers capitate, cream or pinkish-white, nos. 582; Jackson 333a ("Marambayet"); Abyssinia, Eritrea, Sudan. *A. stenocarpa* Hochst.; 6500–7500 ft., tree to 20 ft., flowers capitate, yellow, pods narrow, brown, nos. 75; Jackson 332 ("Ndiniet"); East Africa generally.

Albizzia.—*A. gummifera* (Gmel.) C. A. Smith; 6500–7500 ft., forest tree 35–60 ft., with tall straight bole and large spreading crown, flower-heads paniculate, flowers white, filaments united in a tube, red, pods brown, nos. 511; Jackson 336 (Seswet); Tropical Africa generally, and South Africa.

Papilionaceae.

Crotalaria.—*C. glauca* Willd.; 6500–7500 ft., glabrous, erect herb, 12–18 in., leaves unifoliolate, somewhat glaucous, flowers yellow, in lax racemes, pods about 1 in. long, nos. 198; 459; widely distributed in Tropical and South Africa. *C. Lugardiorum* Bullock*; 6500–7500 ft., spreading herb 12–18 in., stems, lower surface of the unifoliolate leaves, inflorescence, calyx, and pods clothed with short black-based stout hairs, flowers in lax racemes, yellow above, russet below, nos. 197; 530. *C. cephalotes* Steud.; 6500–7500 ft., pubescent, spreading, 6–12 in., flowers in heads, orange yellow, pods subglobose, hairy; no. 170; Tropical Africa generally, and the Transvaal. *C. agatiflora* Schweinf.; 6500–7500 ft., uncommon, shrub to 6 ft., flowers large, yellow, no. 153; East Africa generally, southwards to northern Tanganyika. *C. keniensis* E. G. Baker; 8500–9000 ft., shrub, semiscandent, 4–6 ft., flowers yellow, nos. 320; 481; Kenya, Aberdares, Meru. *C. cleomifolia* Welw. ex Baker; 6500–7500 ft., erect, 6–7 ft., flowers yellow, in hairy racemes often over 1 ft. long, nos. 2; 187; widely distributed in Tropical Africa. *C. recta* Steud.; 7000 ft., erect to 4 ft., flowers yellow, racemes stout, up to 1 ft. long, no. 440; East Africa southwards to Nyasaland, and in the Belgian Congo. *C. Plowdeni* Baker; 6500–7500 ft., spreading to 2 ft., flowers yellow, no. 207; Abyssinia and Taita Hills. *C. intermedia* Kotschy; 6500–7500 ft., shrub 5–8 ft., flowers yellow or russet, nos. 24; 216; widely distributed in Tropical Africa.

Argyrolobium.—*A. leucophyllum* Baker; 6500–7500 ft., erect to 3 ft., flowers yellow, no. 33; Kenya Colony westwards to Ruwenzori and southwards to Nyasaland.

Adenocarpus.—*A. Mannii* Hook. f.; 11,700 ft., shrub to 4 ft., flowers yellow, no. 359; widely distributed in Tropical Africa.

Trifolium.—*T. multinerve* A. Rich.; 11,500 ft., ground creeper, flowers purple, 2–5 in each head, no. 397; Abyssinia, Eritrea, Kenya. *T. acaule* Steud.; 13,000 ft., small ground creeper, flowers mauve, 1–3 in each head, no. 329; Abyssinia, Eritrea, Kenya. *T. simense* Fresen.; 8500 ft., erect to 18 in, leaflets linear lanceolate, flowers magenta, numerous, subspicate, no. 344; East Africa generally, extending to Cameroons Mt. and Fernando Po. *T. Lugardii* Bullock*; 6500–7500 ft., erect to 2 ft., flowers purple, numerous, no. 97. *T. cryptopodium* Steud.; 12,800 ft., ground creeper, leaves very small, flowers bluish purple, numerous, no. 333; Abyssinia, Aberdares, Kilimanjaro. *T. semipilosum* Fresen.; 10,000 ft., ground creeper, flowers white, numerous, no. 351; mountains of Abyssinia and Kenya Colony, and on Kilimanjaro. *T. subrotundum* Hochst. et Steud.; 11,800 ft., suberect, flowers purple, numerous, leaflets obovate, no. 485; East Africa southwards to Nyasaland and Angola, and westwards to Cameroons Mt. and Fernando Po. *T. Steudneri* Schweinf.; 8000 ft., erect to 6 in., leaflets linear-oblong, flowers purple, numerous, no. 38; Abyssinia, Eritrea.

Lotus.—*L. Oehleri* Harms; 8650 ft., pubescent shrub to 2 ft., flowers cream and purple, no. 495; Aberdares. *L. Brandianus* Harms; collected with the preceding, glabrous or nearly so; no. 495a; also in Tanganyika.

Indigofera.—*I. subargentea* De Wild.; 6500–7500 ft., spreading, to 8 in., flowers salmon pink, nos. 167; 208; north-eastern Congo and Ankole.

Tephrosia.—*T. linearis* Pers.; 6500–7500 ft., slender erect herb 2–3 ft., flowers yellow, in lax narrow panicles, no. 70; widely spread in East and West Africa. *T. interrupta* Hochst. et Steud.; 6400 ft., erect to 10 ft., flowers bright purple, in interrupted narrow panicles about 12 in. long, no. 539; Abyssinia, and probably widely spread in Kenya Colony. *T. atro-violacea* E. G. Baker; 8000 ft., erect to 8 ft., flowers purple, calyx clothed with dark brown or black hairs, no. 43; Kenya Colony, Belgian Congo and northern Tanganyika.

Craibia.—*C. Brownii* Dunn; 6500 ft., a tree about 20–30 ft., flowers cream, tinged pale pink, or mauve, nos. 659; s.n.; [" Cleptewewet "—Mr. H. B. Dooner]; Kenya Colony, Uganda (Mabira Forest) and Tanganyika (Singida Distr.).

Sesbania.—*S. aegyptiaca* Poir.; 6500–7500 ft., tree to 20 ft., flowers yellow, standard purple-mottled, no. 196; widely spread in Tropical Africa and extending to Transvaal and Natal, and common in most tropical countries.

Colutea.—*C. istria* Mill.; 8000 ft., erect shrub to 6 ft., flowers deep maroon, pods brown, bladder-like, no. 271; East Africa, Arabia, Persia and Asia Minor.

Astragalus.—*A. somalensis* Taub. var. *Lindblomii* Harms; 6500–7500 ft., erect to 4 ft., flowers purple; No. 14. *A. elgonensis* Bullock*; 12,800 ft., creeping, flowers mauve-pink, no. 334; infected with the rust fungus *Uromyces Astragali* (Opiz) Sacc. (det. Miss E. M. Wakefield).

Aeschynomene.—*A. Schimperi* Hochst. ex Baker; 6500–7500 ft., erect to 3 ft., flowers orange, pods articulate, with stiff scattered hairs and prickles, no. 15; East Africa, extending to Rhodesia.

Zornia.—*Z. tetraphylla* Michx.; 6500–7500 ft., ground creeper, flowers brick red to salmon pink, leaves 4-foliolate, nos. 159; 176; Kenya Colony and Uganda southwards to Rhodesia, Angola and South Africa.

Desmodium.—*D. Scalpe* DC.; 6500–9000 ft., climber with orange or terra-cotta flowers, pods articulate, nos. 39; 220; widely distributed.

Vicia.—*V.* sp.; 8800 ft., a hairy tendril climber, flowers violet-blue, in 3–4-flowered racemes, no. 343a; material insufficient for determination.

Lathyrus.—*L. hygrophilus* Taub.; 6500–7500 ft., tendril climber, leaves bifoliolate, flowers solitary, yellow, no. 16; Aberdares, Kilimanjaro, Virunga Mts. and Nyasaland.

Glycine.—*G. javanica* Linn.; 6500–7500 ft., twiner to 16 ft., flowers white with mauve throat, in raceme-like panicles about 6 in. long, pods densely brown-hairy, nos. 129; 244; 451; widely distributed.

Erythrina.—*E. tomentosa* R. Br.; 6500–7500 ft., tree to 15 ft., bole with thick corky bark, recurved prickles on smaller branches and leaf-rhachis, flowers scarlet, seeds scarlet and black, no. 117; East Africa southwards to Southern Rhodesia.

Vigna.—*V. gracilis* (Guill. et Perr.) Hook. f.; 6500–7500 ft., twiner, flowers blue, no. 180; Kenya, Taita Hills, and the eastern half of Tanganyika. *V. Schimperi* Baker; 7000 ft., twiner with yellow flowers, no. 246; Abyssinia, Kenya, Kabete grasslands. *V. fragrans* E. G. Baker; 6100 ft., about 2 in. (to 1 ft.) high, flowers mauve, peduncle arising from the rootstock before the leafy shoots, no. 528; Ankole (Uganda) and probably also on the Nandi Plateau, and in Northern Tanganyika. *V. vexillata* Benth.; 6500–7500 ft., twiner, flowers large, purple, pods linear, brown-hairy, no. 62; widely distributed. *V. pygmaea* R. E. Fries (?); 6000–6700 ft., dwarf, erect to 4 in., flowers green to mauve, nos. 528a; 575; Rhodesia, Nyasaland.

Dolichos.—*D. formosus* A. Rich.; 6500–7500 ft., twiner, flowers purple or pink, nos. 18; 89; 460; Abyssinia, Eritrea. *D. biflorus*

Linn.; 6500 ft., twiner, flowers green, in pairs, no. 501; widely distributed. *D. Lablab* Linn.; 6500–7500 ft., climber, flowers purple-pink, in long racemes, no. 133; widely distributed.

Rhynchosia.—*R. usambarensis* Taub.; 6500–7500 ft., creeping, foliage variegated, flowers yellow and maroon, in lax axillary racemes, no. 163; Aberdares and surrounding plateaux, Kilimanjaro, Usambara.

Eriosema.—*E. cordifolium* Hochst. (?); 6700 ft., trailing on ground, leaves unifoliolate, flowers yellow and chocolate, in racemes, no. 649; Abyssinia, N. Nigeria. *E. sparsiflorum* E. G. Baker; 6100 ft., erect to 1 ft., leaves trifoliolate, flowers yellow and russet, in lax axillary racemes, no. 567; Djurland and the Sudan westwards to N. Nigeria.

Flemingia.—*F. rhodocarpa* Baker; 6500 ft., shrub to 5 ft. flowers greenish white, pods short, orange-red, due to a dense coating of glands, no. 67; Kenya Colony and Uganda southward to Rhodesia.

Hamamelidaceae.

Trichocladus.—*T. malosanus* Baker; 6500–7500 ft., shrub or tree 20–30 ft., flowers yellow, nos. 289; Jackson 311; Kenya Colony and Uganda, and in N. W. Rhodesia.

Moraceae.

Dorstenia.—*D. tropaeolifolia* (Scwheinf.) Bureau; 7300 ft., erect to 4 in., leaves adpressed to ground, flowers creamy pink, no. 617; Gallabat, Unyoro, Serere, and in Kenya Colony south-east of Mt. Elgon; also (Milbraed 9433) a very large form at Buar, Cameroons.

Urticaceae.

Urtica.—*U. massaica* Mildbr.; stinging herb, erect to 4 ft., flowers green, no. 200; Kenya, Aberdares, Ruwenzori, Virunga Mts., Masai highlands and Meru.

Laportea.—*L. alatipes* Hook. f.; 11,500 ft., a stinging herb of the forest undergrowth, flowers green in axillary and terminal panicles, Tweedie A9; Kenya, Aberdares, Kilimanjaro, Meru, Ruwenzori and Cameroons Mt., and probably also in Rhodesia.

Celastraceae.

Elaeodendron.—*E. Buchanani* Loes.; 6500–7500 ft., tree 30–40 ft., flowers whitish or pale green; Jackson 318a; 328a ("Sainet"); Buddu, Nyasaland, Portuguese East Africa, Gazaland and Angola. *E. sp.* indet.; 6500–7500 ft., shrub or tree 15–20 ft., flowers white, fruit pale green (neither collected), Jackson 307 ("Chepkatet"); specimens of this species from Kenya and Aberdares are preserved at Kew.

Gymnosporia.—*G. lancifolia* Loes.; 6500–7500 ft., tree to 40 ft., fruit pale green to yellow, nos. 547; s.n.; Jackson 327; 342a ("Chemoia," "Kwongwet"); widely distributed in East Africa southwards to the Livingstone Mts. *G. maranguensis* Loes.; 6500–7000 ft., erect shrub with straight spines, seeds orange brown, in light brown capsule, no. 278; Kenya, Kilimanjaro. *G. Atkaio* (A. Rich.) Loes.; 6500–7500 ft., shrub or small tree 15–20 ft., flowers small, white in axillary puberulous cymes, nos. 678; Jackson 306a ("Kwangwet"); Abyssinia, Kenya.

The following specimens belong to this genus, but have not been satisfactorily determined: nos. 653; 692; s.n.

Loranthaceae.

Loranthus.—*L. curviflorus* Benth.; 6500–7500 ft., parasite on *Acacia* sp., flowers yellow-red, no. 157; East Africa as far south as the Livingstone Mts., and in Arabia. *L. usuiensis* Oliv.; 6500–7500 ft., a parasite, flowers deep red, nos. 172; Jackson 317a; forest areas of Kenya Colony, Uganda, and Tanganyika. *L. woodfordioides* Schweinf.; 6500–8500 ft., parasite, flowers scarlet and grey, berries pink, Nos. 80; 552; 552a; Jackson 314a; Somaliland, high altitudes in Kenya Colony, Virunga Mts.

Viscum.—*V. nervosum* Hochst.; 6500–7500 ft., parasite, flowers yellow, berries white, *Jackson* 315a; widely distributed in East Africa, extending southwards to Natal and westwards to S. Nigeria and St. Thomas Is.

Loranthaceous parasites are known to the Ul Kony by the general name "Mondowet" (*teste* Jackson).

Santalaceae.

Osyris.—*O. abyssinica* Hochst. ex A. Rich.; 8100 ft., spreading shrub to 12 ft., flowers yellow, fruit scarlet, no. 517; East Africa generally, extending westward through Nyasaland and Rhodesia to Angola and S. W. Africa; also in South Africa and Arabia.

Rhamnaceae.

Rhamnus.—*R. prinoides* L'Hérit.; 6500–7500 ft., shrub to 10 ft., with very shiny foliage, flowers green-maroon, nos. 576; Jackson 334a; widely distributed in eastern Africa from Abyssinia to the Cape, extending westwards to Ruwenzori, Virunga Mts., and Cameroons Mt.

Scutia.—*S. myrtina* (Burm.) Kurz; 6500–7500 ft., climbing shrub 20–30 ft., armed with recurved prickles, flowers and fruits green, nos. 292; 621; Jackson 323a; widely distributed in eastern Africa, extending to the Mascarene Is. and India.

Helinus.—*H. mystacinus* (Ait.) E. Mey.; 6500–7500 ft., climber to 50 ft., flowers white or green; nos. 128; Jackson 308; East Africa, Virunga Mts., Gazaland, Southern Rhodesia.

Ampelidaceae.

Rhoicissus.—*R. erythrodes* (Fresen.) Planch.; 6500–7500 ft., creeper over trees, to 30 ft., flowers green, no. 283; widely distributed in East and South Africa, extending westwards to N. Nigeria in the north, and to Angola in the south; also in Arabia.

Cissus.—*C. Kaje* Gilg; 6700 ft., tendril climber or creeper, stems and petioles clothed with crimson glandular hairs, flowers green, no. 643; also on the Livingstone Mts. *C. nodiglandulosa* Th. Fries jr.; without notes; a tendril climber like the last, but stems glandular only near the nodes, and leaves densely tomentose below, s.n.; also on Kenya. *C. cyphopetala* Fresen.; 6500–7500 ft., tendril climber to 20 ft., stems not glandular, leaves tomentose below, flowers pale green, fruit green, hairy, Jackson 343 ("Nablabalait"); Abyssinia, Eldoma, Mau, and Cameroons (Kongola, Mbussa). *C. jatrophoides* (Welw. ex Baker) Planch.; 6600 ft., glabrous, erect to 30 in., leaves sessile, flowers green, fruit orange, no. 500; Tanganyika southwards and westwards to Rhodesia and Angola, and in the Cameroons (Buar).

Rutaceae.

Toddalia.—*T. asiatica* Lam., 6500–7500 ft., spiny scrambling shrub 20–30 ft., flowers whitish green, fruits orange, seeds strongly aromatic, nos. 537; 679; Jackson 302a; widely distributed in warm regions of the Old World.

Teclea.—*T. nobilis* Del.; 6500–7500 ft., tree 20–30 ft., fruit red; Jackson 330a ("Quiriondet"); East Africa and the Sudan southwards to Nyasaland and Rhodesia. The seed is ground, boiled, and given to cattle as a laxative.

Meliaceae.

Ekebergia.—*E. Rueppeliana* Fresen. ex A. Rich.; 6500–7500 ft., tree up to 150–200 ft. high with an enormous spread, the largest tree in the Elgon forests excepting *Podocarpus*, flowers white or pink, fruit brown, Jackson 309a; 350; 351a ("Nenwet"; "Kabrimetet"); Abyssinia, Eritrea, Sudan, Kenya, Kilimanjaro and Meru.

Trichilia.—*T. Volkensii* Gürke; 6500–7500 ft., tall tree, 40–50 ft., flowers pale green, Jackson 339a ("Pionyet"); Kenya Colony southwards to Nyasaland.

Turraea.—*T. Holstii* Gürke; 6800 ft., shady places in forest country, shrub 15–20 ft., flowers pendulous, white with a strong jasmine scent, capsule green, seeds red, nos. 623; Jackson 301a ("Timbiriandet"); Tanganyika.

Sapindaceae.

Allophylus.—*A. macrobotrys* Gilg; 6500–7500 ft., shrub 15–20 ft., flowers white, fruits green, nos. 671; Jackson 316a; Uganda,

N. W. Tanganyika. *A. subcoriaceus* E. G. Baker; 6500–7500 ft., shrub, fruits green, Jackson 320a; Uganda, Kenya Colony. *A. abyssinicus* (Hochst.) Radlk.; 8000 ft., shrub 6 ft., flowers dirty white, no. 256; East Africa.

A further specimen of this genus, no. 508, was too badly galled for accurate determination.

Deinbollia.—*D. kilimandscharica* Taub.; without notes, s.n.; S. Kenya Colony (including Nyanza Basin), Kilimanjaro.

Melianthaceae.

Bersama.—*B. Engleriana* Gürke; 6500–7500 ft., spreading tree 25–50 ft., flowers white, pink in bud, nos. 239; Jackson 325; Kenya Colony, Uganda.

Anacardiaceae.

Rhus.—*R. glaucescens* A. Rich. (*sens. ampl.*); 6500–7500 ft., somewhat glaucous shrub or tree to 20 ft., flowers whitish green, small, in axillary panicles, fruit green, nos. 136; Jackson 313a ("Siruet"); East Africa and S. E. Tropical Africa, and westwards to N. Nigeria. *R. incana* Mill. (*sens. ampl.*); 6500–7500 ft., shrub 20–30 ft., leaves and young stems densely villous, flowers pale green, fruit edible, maroon, Jackson 326a ("Siruet"); widely distributed in Tropical and South Africa. *R. inamoena* Standley; 6500–7500 ft., glabrous tree 30–40 ft., flowers white, in axillary and terminal panicles, fruits green, foliage pale green, Jackson 312a ("Ingororowet"); Kenya Colony, Zanzibar and southwards to Lake Nyasa.

Heeria.—*H. reticulata* (E. G. Baker) Engl.; 7000 ft., spreading tree to 15 ft., leaves simple, strongly reticulate below, flowers small, green, in terminal panicles, no. 288; Kenya Colony and Uganda southward to Nyasaland and Gazaland.

Araliaceae.

Cussonia.—*C. spicata* Thunb.; 6500 ft., palm-like tree about 15 ft., with flowers in stout cylindrical spikes, no. 695 (sterile); Kenya Colony, Uganda, Tanganyika and southwards to the Cape.

Umbelliferae.

Hydrocotyle.—*H. Mannii* Hook. f.; 11,000 ft., by water, Tweedie 31; Aberdares and Kilimanjaro westwards to Ruwenzori, Cameroons Mt. and Fernando Po.

Alepidea.—*A. Fischeri* (Engl.) Schlect. et Wolff; 10,200 ft., erect to 18 in., flowers white, no. 353; south-western Kenya Colony, southwards to Nyasaland and Katanga.

Sanicula.—*S. europaea* Linn.; 8000 ft., erect to 15 in., flowers white, nos. 58; 691; high mountains of Tropical Africa and S. Africa, and in Europe, Asia, and America.

Trachydium.—*T. abyssinicum* (Hochst.) Benth. et Hook. f. ex Hiern; 13,000–13,800 ft., rosette herb with compound umbels of creamy white flowers on short peduncles, no. 686; Abyssinia, Kenya, Aberdares, Mau, Nandi, Kilimanjaro and Shira Mts.

Pimpinella.—*P. Volkensii* Engl.; 8000 ft., erect to 5 ft., flowers white, no. 37; Kenya, Aberdares, Kilimanjaro.

Anthriscus.—*A. dissectus* C. H. Wright; 13,000 ft., herb 5–8 ft., flowers white, Tweedie 80; Ruwenzori and Virunga Mts.

Ferula.—*F. montis-Elgonis* Bullock*; 12,000 ft., up to 7 ft., flowers cream, enclosed in pale green "bracts" (bases of undeveloped leaves); no. 425.

Peucedanum.—*P. Kerstenii* Engl.; 11,500 ft., erect to 5 ft., flowers creamy yellow, No. 429; Kenya, Aberdares, Ruwenzori, Kilimanjaro, Shira and Virunga Mts.

Lefeburia.—*L. brevipes* Engl. ex Wolff; 6500–7500 ft., erect to 10 ft., flowers deep crimson, fruits grey, no. 275; Busoga, Mpororo.

Heracleum.—*H. elgonense* (Wolff) Bullock*; 11,650 ft., erect to 8 ft., flowers white, no. 405; Kenya.

Caucalis.—*C. gracilis* (Hook. f.) Wolff ex Mildbr.; 7000 ft., erect, 30 in., flowers green, no. 245; Kenya Colony, Uganda, Tanganyika, Cameroons Mt.

Ericaceae.

Agauria.—*A. salicifolia* (Comm. ex Lam.) Hook. f.; 10,500–11,500 ft., arbutus-like tree with creamy-pink bell-shaped flowers, no. 684; widely spread on all the mountains of Tropical Africa, and in the Mascarene Islands.

Erica.—*E. arborea* Linn.; 10,200–12,000 ft., shrub to 20 ft., flowers white, no. 314; East African Mts.

Blaeria.—*B. elgonensis* Alm et Th. Fries jr.; 12,000–13,000 ft., viscid shrublet up to 12 in., flowers purple or mauve, nos. 316; 483. *B. Granvikii* Alm et Th. Fries jr.; 12,500 ft., erect shrublet to 1 ft., flowers mauvy pink, indumentum partly of subplumose hairs, not viscid, no. 685.

Ebenaceae.

Euclea.—*E. keniensis* R. E. Fries; 6500–7500 ft., tree 20–30 ft., flowers pale green, fruit green, the root is used as a medicine for tapeworm by the Ul Kony, nos. 654; 669; Jackson 329a ("Shiendet"); Kenya Colony, eastern Uganda, and northern Tanganyika.

Myrsinaceae.

Myrsine.—*M. africana* Linn.; 11,800 ft., box-like shrub to 6 ft., no. 366; eastern, southern Tropical and South Africa generally.

Loganiaceae.

Buddleja.—*B. polystachya* Fresen.; 6500–7500 ft., shrub to 15 ft., flowers orange, slightly scented, no. 217; East Africa as far south as Hanang Mt., and in Arabia.

Lachnopylis.—*L. congesta* (R. Br. ex Fresen.) C. A. Smith; 6500–7500 ft., tree 40–50 ft., flowers white, Jackson 340a (" Choruet "); East Africa southwards to Nyasaland and westwards to the Virunga Mts.

Oleaceae.

Jasminum.—*J. abyssinicum* R. Br.; 6500–7500 ft., climber to 25 ft., flowers pure white or tinged mauve, very sweet-scented; fruits black, nos. 141; 626; Jackson 319a (" Kipteiit "); East Africa westwards to the Virunga Mts.

Schrebera.—*S. alata* (Hochst.) Welw.; 6500–7500 ft., tree 30–40 ft. fruits obovoid, woody, splitting into 2 valves, Jackson 344a (" Kakawet "); Abyssinia, Nyasaland.

Olea.—*O. chrysophylla* Lam.; 6000–10,500 ft., tree to 20 ft., flowers greenish white, nos. 284; 473 (Wild Olive); East Africa westwards to Jebel Marra, Ruwenzori and Virunga Mts., eastwards to Arabia, and southwards to South Africa; also in Mauritius and Bourbon.

Apocynaceae.

Carissa.—*C. edulis* Vahl; 6500–7500 ft., spiny erect shrub to 20 ft., flowers strongly scented, white, pink below, fruits deep red, latex milky, very sticky, nos. 66; 276; Jackson 324a (" Nagatetwet "); Tropical Africa generally, extending to Arabia and Socotra.

Asclepiadaceae.

Asclepias.—*A. semilunata* (A. Rich.) N. E. Br.; 6700–10,000 ft., spreading shrub to 5 ft., with milky latex, flowers umbellate, dirty white or cream with maroon centre, fruits inflated, bladder-like, covered with long weak bristles, nos. 79; 372; 510; East Africa westwards to Niam-niam, and in Angola. *A. macrantha* Hochst.; 6000 ft., in swamp, erect to 18 in., leaves long-linear, flowers orange-red, no. 282; East Africa.

Schizoglossum.—*S. eximium* (Schlect.) N. E. Br.; 6600 ft., erect to 2 ft., leaves oblong, flowers cream, with conspicuous maroon corona, no. 570; Uganda, Sudan (Lado) and Nandi Plateau.

Margaretta.—*M. rosea* Oliv.; 6500–7500 ft., springing up immediately after grass fires, erect to 1 ft., flowers pink, orange or lemon, nos. 111; 112; 112a; Uganda, Sudan (Lado) and Nandi Plateau.

Sarcostemma.—*S. viminale* (Linn.) R. Br.; 6500 ft., twiner to 15 ft., leafless, with milky latex, no. 503; widely distributed in Tropical and South Africa.

Cynanchum.—*C. altiscandens* K. Schum.; 6500 ft., slender twiner with pedunculate subumbels of small greenish flowers with a white tubular corona, no. 656a; East Africa.

Tylophora.—*T. Lugardae* Bullock*; 6500 ft., slender twiner, flowers in one or two clusters on the slender peduncle, green with a maroon centre, no. 656.

Sphaerocodon.—*S. obtusifolium* Benth.; 7700 ft., shrub to 2 ft., flowers umbellate or almost fasciculate, maroon, no. 618; N. Nigeria, Ruwenzori, Rhodesia, Angola.

Marsdenia.—*M. Schimperi* (Hochst. MS) Decne.; 6500 ft., creeper, flowers dirty white, scented, no. 599; Abyssinia, Eritrea, Kilimanjaro, and Mbulu and Kondoa districts of Tanganyika.

Rubiaceae.

Hymenodictyon.—*H. floribundum* (Hochst. et Steud.) B. L. Robinson; 6500–7500 ft., deciduous tree to 15 ft., leaves turn scarlet before falling, flowers in terminal spikes, fruits capsular, no. 156; widely spread in Tropical Africa.

Pentas.—*P. carnea* Benth.; 6500–7500 ft., erect to 3 ft., flowers pink (a white form also occurs), no. 105; East Africa southwards to Nyasaland. *P. longiflora* Oliv.; 6500–7500 ft., erect to 6 ft., flowers white, no. 144; Kenya Colony, Uganda and Tanganyika westwards to Ruwenzori and the Virunga Mts. *P. Schimperiana* Vatke; 9000 ft., shrub to 4 ft., flowers white tinged pink, no. 407; East Africa southwards to Nyasaland. *P. verticillata* K. Schum.; 6500–7500 ft., erect to 3 ft., leaves in whorls of 3 or 4, flowers cream, no. 9; Kenya Colony, Uganda, Tanganyika, Nyasaland, N. Rhodesia and Angola.

Oldenlandia.—*O. abyssinica* (Hochst. ex A. Rich.) Hiern; 6500–7500 ft., erect to 2 ft., flowers scarlet, no. 100; East Africa, extending to West Africa, and N. and S. Rhodesia. *O. monanthos* (Hochst. ex A. Rich.) Hiern; 8500–8650 ft., spreading herb to 2 ft., flowers solitary, pale mauve or pink, nos. 345; 494; Abyssinia, Kenya, Aberdares. *O. hedyotoides* (Fisch. et Mey.) Boiss.; 6500–7500 ft., spreading herb to 8 in., flowers glomerulate, white, no. 231; Abyssinia to Upper Egypt, Uasin Gishu Plateau, Kipkarren, and in southern Tropical Africa westwards to N. W. Rhodesia. *O. scopulorum* Bullock*; 7500 and 8250 ft., around rocks in open spaces, tufted herb 3–5 in., flowers white or pale mauve-pink, nos. 49; 346.

Pentanisia.—*P. Schweinfurthii* Hiern; 6100 ft., erect herb from a woody rootstock, 6–9 in., flowers bright blue, no. 529; N. Nigeria, Niam-niam, Nandi, Moshi, Iringa, Livingstone Mts., Nyasaland, and Rhodesia westwards to Mwinilunga. *P. parviflora* Stapf MS.; 6500–7500 ft., erect to 8 in., much branched, flowers blue, glomerate in the leaf-axils, nos. 17; 99; Serere (Uganda) and S. W. Kenya Colony.

Canthium.—*C. rubrocostatum* Robyns; 6500–7500 ft., tree 20–30 ft. fruit green, leaves reddish below, *Jackson* 322; Kenya, Usambara.

Vangueria.—*V. apiculata* K. Schum.; 6500–7500 ft., spreading tree to 20 ft., flowers green, nos. 234; 234a; Sudan (Lado), Kenya Colony, Uganda, Tanganyika. *V. acutiloba* Robyns; 6500–7500 ft., deciduous spreading tree 20–30 ft., flowers white or green, fruit edible, globose, 1¼ in. diam., light brown or yellow, nos. 571; Jackson 331a ("Kamolwet"); southern Uganda and Kenya Colony, and Kilimanjaro. *V. linearisepala* K. Schum.; 6600 ft., shrub to 15 ft., flowers green, no. 622; southern Kenya Colony, and Kwai, Tanganyika.

Pavetta.—*P. Oliveriana* Hiern; 6600 ft., spreading shrub to 8 ft., flowers white, stigma long-exserted, fruit black, no. 586, Sudan (Lado), Uganda and western Kenya Colony, and Kilimanjaro.

Coffea.—*C. eugenioides* S. Moore; 6500 ft., in heavy forest shade, erect spreading shrub 10–15 ft., flowers cream, fruit deep crimson, nos. 310; 505; 505a ("Nandi" Coffee); Kenya Colony and Uganda forests westwards to Ruwenzori.

Anthospermum.—*A. Whyteanum* Britt.; 11,500 ft., shrub to 10 ft., flowers pale yellow, no. 403; Aberdares, Kenya, Kilimanjaro, Usambara, etc., southwards to Nyasaland.

Rubia.—*R. longipetiolata* Bullock*; 6500–7500 ft., climbing herb with small recurved prickles, flowers green, fruit black, no. 204; Eldama Ravine, Mau, and in Uganda.

Galium.—*G. mollicomum* Bullock*; 11,000 and 11,800 ft., decumbent or tufted, leaves smooth, flowers yellow; nos. 400; 400a. *G. afro-alpinum* Bullock*; 10,000–12,000 ft., creeeping plant, leaves with the edges shortly recurved-aculeate, flowers pale yellow, no. 365.

Caprifoliaceae.

Sambucus.—*S. adnata* Wall. ex DC.; 9800 ft., shrub to 10 ft., flowers white, no. 427; Kenya, Aberdares, also in the Himalaya.

Dipsacaceae.

Dipsacus.—*D. pinnatifidus* Steud.; 8500 ft., erect to 8 ft., stems and leaf-veins very prickly, flowers capitate, white, no. 261; East Africa and Virunga Mts. as far south as Kilimanjaro.

Scabiosa.—*S. Columbaria* Linn.; 8500–12,000 ft., erect, 10 in. to 2 ft., flowers capitate, mauve, nos. 342; 394; an extremely variable plant widely distributed in Eastern and South Tropical Africa, North Africa and Europe, and (?) in S. Africa.

Valerianaceae.

Valeriana.—*V. elgonensis* Mildbr.; 13,500 ft., shrubby, 18 in., flowers puce, no. 404. Described from specimens collected by Granvik in 1920, this plant was first collected by Battiscombe (no. 676), who sent it to Kew in 1913. *V. Volkensii* Engl.; 10,000–11,500 ft., erect herb with lax terminal panicle, Tweedie B6; Kilimanjaro, Ruwenzori.

Compositae.

Erlangea.—*E. fusca* S. Moore; 10,200 ft., shrub to 6 ft., leaves silvery tomentose below, flowers mauve, no. 370; Aberdares. *E. tomentosa* S. Moore; 6500–7500 ft., coarsely tomentose, erect to 6 ft., flowers mauve, no. 106; Kenya Colony and Uganda southwards to Nyasaland.

Vernonia.—*V. afromontana* R. E. Fries; 7000 ft., erect shrub to 6 ft., flowers mauve; no. 252; Kenya, Aberdares. *V. amygdalina* Del.; 6500–7500 ft., in open spaces in forest country, shrub 10–15 ft., of open habit, spreading above, flowers white to mauve, Jackson 303 ("Cheburiandet"); widely distributed in Tropical Africa. *V. cistifolia* O. Hoffm.; 6500–7500 ft., erect to 7 ft., flowers purple, in very large terminal panicles, no. 8; Kenya Colony, Uganda, Tanganyika, westwards to Virunga Mts. and Bauchi Plateau, and southwards to N. E. Rhodesia, S. Rhodesia and Gazaland. *V. Grantii* Oliv.; 6500–7500 ft., erect to 3 ft., flowers purple and white, no. 32; Kenya Colony, Uganda, Iringi, and probably as far south as Nyasaland. *V. hymenolepis* A. Rich.; 6500–7500 ft., shrub to 10 ft., involucre white, flowers purple, no. 155; Abyssinia, Uasin Gishu Plateau and Uganda westwards to Ruwenzori. *V. jugalis* Oliv. et Hiern; 6500–7500 ft., shrub to 6 ft., flowers purple, no. 173; Sudan Congo, Uganda, Kenya Colony. *V. dumicola* S. Moore; 6500 ft., erect shrub to 6 ft., flowers mauve, involucral bracts mauve-tipped, no. 507; Uganda (Victoria Nyanza basin). *V. uniflora* Hutch. et J. M. Dalz.; 6500–7500 ft., shrub to 12 ft., flowers mauve, in very small uniflorous capitula, no. 235; Kenya Colony, Uganda, and Cameroons Mt. *V. pumila* Kotschy et Peyr.; 6100 ft., erect to 3 in., leafless at time of flowering, flowers clustered, purple, no. 523; Nandi, Madi, Sudan, westwards through Northern Nigeria to French Guinea. *V. Smithiana* Less.; 6500–7500 ft., erect herb. 8 in. to 2 ft., flowers pink; no. 442; Uganda, Kenya Colony, Tanganyika, westwards through French Sudan to French Guinea, and in Angola. *V. syringifolia* O. Hoffm.; 8000–10,000 ft., Tweedie 86; Kenya, Aberdares.

Adenostemma.—*A. caffr* DC.; 6500–7500 ft., in swampy places, spreading herb to 3 ft., flowers white, nos. 183; 574; widely distributed in the warm regions of both hemispheres.

Mikania.—*M. scandens* Willd.; 6500–7500 ft., climber to 20 ft., flowers white, no. 135; widely distributed in the warm regions of both hemispheres.

Dichrocephala.—*D. chrysanthemifolia* DC.; 6500–7500 ft., erect herb to 2 ft., capitula globose, yellow-white, no. 241; widely distributed in warm regions of the Old World.

Microglossa.—*M. volubilis* (Wall.) DC.; 6500–7500 ft., shrub 8–10 ft., often subscandent, flowers cream, nos. 174; 655; Tropical Africa generally, extending through Asia to China and Japan.

Conyza.—*C. aegyptiaca* (Linn.) Ait.; 6500–7500 ft., erect herb to 4 ft., flowers yellowish white, no. 210; a tropical weed. *C. Newii* Oliv. et Hiern; 9000 ft., erect woody herb to 5 ft., flowers pale cream, no. 401; Kenya, Aberdares, Virunga Mts., Kilimanjaro, Usambara Mts. *C. stricta* Willd.; 6500–7500 ft., erect herb with simple stems, flowers yellowish-white, no. 31; Tropical Africa eastwards to India. *C. ruwenzoriensis* (S. Moore) R. E. Fries; 11,000–12,000 ft., herb, woody below, to 3 ft., very like the last, but stems much branched, flowers yellow, nos. 312; 383; Ruwenzori, Virunga Mts., Athi Plains, Aberdares. *C. Schimperi* Sch. Bip.; 8500 ft., erect to 3 ft., leaves pinnatipartite, segments linear, flowers yellow, no. 319; Abyssinia, mountains of Kenya Colony, Virunga Mts. *C. subscaposa* O. Hoffm.; 7300 ft., rosette herb, flowering shoot almost leafless, with a terminal cluster of capitula, flowers pale yellow, no. 616; Kenya, Aberdares, Ruwenzori and Virunga Mts., westward to Cameroons Mt., and on Kilimanjaro, Usambara, and Hanang.

Laggera.—*L. brevipes* Oliv. et Hiern; 6500–7500 ft., erect to 6 ft., stems winged, capitula in large terminal panicles, flowers purple, no. 119; widely spread from Kenya Colony and Uganda southwards to Rhodesia, and extending westwards to Angola and Lower Congo. *L. elatior* R. E. Fries; 8000 ft., erect herb to 18 in., flowers pink; no. 247; Kenya.

Sphaeranthus.—*S. suaveolens* DC.; 6500–7500 ft., erect herb to 12 in., flowers purple, in globular heads, no. 94; Eastern Africa, from Egypt to Nyasaland. *S. angustifolius* DC.; 6500–7500 ft., in swamps, spreading, to 18 in., flowers pale purple, in globular heads like the last, no. 177; Sudan southwards to Southern Rhodesia.

Helichrysum.—*H. Schimperi* (Sch. Bip. ex A. Rich.) Moeser; 10,000 ft., shrub 5 ft., leaves and stems lanate, flowers pink in bud, opening yellow, nos. 126; 302; 420; East Africa southwards to Shire Highlands, and in Socotra. *H. fruticosum* (Forsk.) Vatke, var. *compactum* Vatke; 12,000 ft., bush to 2 ft., leaves woolly, linear (almost ericoid), flowers yellow, capitula in small dense corymbs, no. 392; Abyssinia, Kenya, Aberdares, Kilimanjaro, Shira Mts., Hanang. *H. coriaceum* Sond.; 6100 ft., erect, 1 ft. or more, capitula in a terminal corymb, flowers yellow, leaves 3-nerved, silvery below, no. 525; Kenya Colony, Uganda, Transvaal and south-eastern Cape. *H. declinatum* (Linn. f.) Less.; 7000–8000 ft., erect, 4–12 in., leaves linear-oblanceolate, silvery, flowers white, no. 57; eastern Tropical and South Africa. *H. Newii* Oliv. et Hiern; 13,600 ft., shrubby, erect to 2 ft., leaves and stems woolly, capitula solitary, yellow in bud, opening cream, no. 386; Abyssinia, Kenya, Aberdares, Kilimanjaro, Shira Mts., Hanang, Virunga Mts. *H. aberdaricum* R. E. Fries; about 13,000 ft., circular shrub to 2 ft., very woody below, leaves ericoid, woolly, forming terminal rosettes on the vegetative shoots, capitula very numerous, each terminal on a leafy peduncle, white, no. 384; Aberdares. *H. armatum* Mattf.; 12,500 ft. to summit, shrubby, spiny, capitula white, foliage very like the preceding, Tweedie 95. *H. amblyphyllum* Mattf.; 13,600 ft., shrub to 2 ft., leaves linear, yellowish-woolly, capitula numerous, subcorymbose, pink outside, white inside, nos. 385; 385a. *H. nandense* S. Moore; 8500 ft. and upwards, shrub to 8 ft., leaves linear, sessile, auriculate, not woolly, capitula cormybose, white, no. 54; Kenya and Aberdares, Mau, Nandi and Uasin Gishu Plateaux, Virunga Mts. *H. lycnophorum* Mattf.; 12,000–13,000 ft., shrub to 2 ft., leaves narrowly triangular, amplexicaule, not woolly, capitula in terminal corymbs, pink, no. 461, Kenya, Aberdares, Kilimanjaro. *H. Meyeri-Johannis* Engl.; 10,300–11,500 ft., erect to 18 in., leaves woolly, stems simple, capitula solitary or few in a terminal cluster, at first pink, becoming white in age, nos. 387; 388; Kilimanjaro. *H. formosissimum* Sch. Bip. ex A. Rich.; 8600–11,800 ft., erect to 3 ft., stems glandular, leaves not woolly, oblong, amplexicaule, capitula corymbose, pink in bud, opening white, nos. 264; 390; Abyssinia, Kenya, Aberdares, Ruwenzori, Virunga Mts. *H. kilimanjari* Oliv. et Hiern; 11,500 ft., shrubby, about 1 ft., leaves woolly, at least below, capitula corymbose, yellow, no. 389; Kilimanjaro, Shira Mts., Usambara and Pare Mts. *H. setosum* Harv.; 8000–8500 ft., erect to 5 ft., leaves thinly herbaceous, not woolly, stems and leaves glandular, capitula large, yellow, nos. 85; 391; Kenya Colony and Uganda westwards to Ruwenzori and Virunga Mts., and southwards to the Cape. *H. rosmarinum* Mattf.; 13,000 ft., erect to 18 in., leaves and stem silvery-tomentose, capitula small, in dense terminal corymbs, yellow, no. 311a. *H. globosum* Sch. Bip. ex A. Rich.; 6500–7500 ft., erect to 3 ft., glabrous, capitula small, in dense subglobose terminal corymbs, white, no. 250; eastern Tropical Africa, and on the Cameroons Mt.

Stoebe.—*S. kilimandscharica* O. Hoffm.; 10,000 ft., ericoid shrub, to 15 ft., stems wiry, flowers golden, no. 315; Kenya, Aberdares, Kilimanjaro.

Inula.—*I. macrophylla* Sch. Bip.; 6500–7500 ft., erect to 8 ft., leaves large, densely softly tomentose below, flowers orange, no. 293; Abyssinia, Mau and Uasin Gishu Plateaux, Uganda, Usambara.

Anisopappus.—*A. africanus* (Hook. f.) Oliv. et Hiern; 6500–7500 ft., erect to 4 ft., flowers yellow, about 1 in. diam., no. 146; widely distributed in Tropical Africa.

Wedelia.—*W. abyssinica* Vatke; 6500–7500 ft., shrub to 20 ft., flowers yellow, ray florets up to 1 in. long, no. 147; Abyssinia, Kenya, Athi Plains, Kilimanjaro.

Melanthera.—*M. pungens* Oliv. et Hiern; 6500–7500 ft., leaves ovate, crenate-serrate, very scabrid, flowers yellow, rays rather inconspicuous, no. 147a [collected without notes with *Wedelia abyssinica*]; Abyssinia, Sudan, Niam-niam.

Guizotia.—*G. oblonga* (Hutch.) Hutch. et Bullock; 6500–7500 ft., erect to 4 ft., leaves twisted, flowers golden yellow, no. 96; S. W. Kenya Colony, Uganda.

Spilanthes.—*S. Acmella* Linn.; 6500–7500 ft., ground creeper, rooting at the nodes, flowers orange, no. 179; widely spread in all warm regions of the Old World.

Coreopsis.—*C. coriacea* O. Hoffm.; 6500–7500 ft., herb, erect to 6 ft., leaves serrate-dentate, flowers golden, rays 1 in. long, disc 1 in. diam., no. 6; Kenya Colony westwards to Ruwenzori. *C. elgonensis* Sherff; 11,700 ft., herb to 2 ft., stems subsimple, leaves doubly deeply trifid, flowers yellow, about 2 in. diam., no. 327a.

Bidens.—*B. pilosa* Linn.; 6500–7500 ft., erect herb, 2½ ft., ray florets white, disc yellow, achenes black, with 2 or 3 horns bearing reflexed barbs, no. 95 ("Black Jack"); a common tropical weed.

Galinsoga.—*G. parviflora* Cav.; 6500–7500 ft., erect herb to 2½ ft., ray florets white, disc orange, no. 107; native of America and now naturalised throughout temperate and warm regions; a weed of cultivation.

Tagetes.—*T. minuta* Linn.; 6500–7500 ft., erect herb to 2 ft., leaves pinnate, pinnae serrate or linear and entire, flowers pale yellow, with the odour of "African Marigold," no. 132; native of America, now widely distributed as a weed.

Anthemis.—*A. abyssinica* Gay ex A. Rich.; 10,200–13,000 ft., a decumbent herb, leaves much dissected, ray florets white, disc yellow, no. 381; Abyssinia, N. W. Kenya Colony, Aberdares, Mau Plateau, Moshi.

Artemisia.—*A. afra* Jacq.; 6500–11,800 ft., erect to 10 ft., foliage silvery, flowers yellow, nos. 77; 465; East Africa, southern Tropical and South Africa.

Gynura.—*G. cernua* (Linn. f.) Benth.; 6500–7500 ft., erect to 2 ft., capitula solitary on long erect peduncles with a very few reduced leaves, flowers purple, no. 439; widely spread in Tropical Africa, and in the Mascarene Islands. *G. vitellina* Benth.; 6500–7500 ft., spreading to 4 ft., capitula solitary on long peduncles, flowers orange, no. 190; widely spread in Tropical Africa. *G. crepidioides* Benth.; 6500–7500 ft., erect to 2½ ft., capitula in drooping corymbose cymes, flowers russet, no. 108 ; widely spread in Tropical Africa, and in the Mascarene Islands. *G. amplexicaulis* Oliv. et Hiern ; 6500–7500 ft., erect to 3 ft., leaves linear-oblong, amplexicaule, capitula erect, up to about 6 in a terminal panicle, flowers brick red, no. 240 ; West African grasslands, E. Sudan. *G. scandens* O. Hoffm. ; spreading (or climbing) to 3 ft., capitula crowded, flowers orange, no. 211 ; East African Mountains, Angola. *G. montuosa* (S. Moore) Bullock* ; 8000–10,000 ft., in shade, erect to 5 ft., capitula corymbose, flowers yellow, nos. 44 ; 258 ; 350a ; widely spread in Tropical Africa, particularly in Kenya Colony.

Cineraria.—*C. kilimandscharica* Engl. ; 10,200 ft., to 4 ft., leaves triangular, doubly dentate, capitula radiate, yellow, no. 301 ; mountains and high plateaux of Kenya Colony and Tanganyika, and on the Virunga Mts. *C. laxiflora* R. E. Fries ; 11,000–13,500 ft., erect herb up to 3 ft., Tweedie 78 ; Aberdares.

Emilia.—*E. integrifolia* Baker ; 6500–7500 ft., associated with herbaceous *Lobelia* in open ground, up to 2 ft., but usually less than 1 ft., leaves linear, flowers purple, no. 101 ; western Kenya Colony, westwards to Ankole, and southwards to N. Rhodesia.

Notonia.—*N. abyssinica* A. Rich. ; 6500 ft., very succulent herb to 5 ft., flowers terra-cotta red, no. 116 ; Abyssinia, Kenya Colony, Uganda and north-eastern Tanganyika (?) and in Nyasaland.

Senecio.—*S. elgonensis* Th. C. E. Fries ; 12,000 ft., tree, leaves bright green, almost glabrous, petiole winged, nos. 437 ; 696 ; 699. *S. Gardneri* Cotton* ; 13,600 ft., tree, leaves densely white-tomentose below, petiole cylindrical, woolly, nos. 438 ; 697 ; 700 ; 701.† *S. multicorymbosus* Klatt ; 8000 ft., branching shrub to 15 ft., capitula in dense panicles, flowers yellow, no. 521 ; Kenya Colony, Uganda, Imatong Mts., Tanganyika, Virunga Mts., Angola. *S. discifolius* Oliv. ; 6500–7500 ft., erect herb to 18 in., leaves glaucous, broadly spathulate, flowers yellow, no. 76 ; Kenya Colony, Uganda, Tanganyika, Rhodesia. *S. ruwenzoriensis* S. Moore ; 7300 ft., erect to 2 ft., leaves sessile, elliptic, entire, succulent, capitula radiate, yellow, laxly corymbose, no. 631 ; Aberdares westward through Uganda to Ankole, Ruwenzori and Virunga Mts., and probably also in the Livingstone Mts. *S. Lugardae* Bullock* ; 6700 ft., erect herb to 18 in., leaves oblong-spathulate, herbaceous, glabrous, capitula discoid, buff, no. 541. *S. caryophyllus* Mattf. ; 11,700–13,500 ft., scapigerous herb, about 3 in., leaves linear, flowers yellow, no. 360. *S. rhamnatophyllus* Mattf. ; 11,500 ft., shrubby, to 2 ft., leaves linear-filiform, capitula radiate, corymbose, no. 306 ; western Kenya

---

†A juvenile form of this, No. 698, with the underside of the leaves less tomentose, was also collected. In addition a further species of this interesting group, *S. amblyphyllus* Cotton, occurs in the bamboo forest zone. By an oversight this name was published in *K.B.* 1932, 473, with the incorrect spelling "amblyophyllus."

Colony. *S. Snowdenii* Hutch.; 10,000 ft., erect herb 2–3 ft., leaves linear, viscid, subentire, capitula yellow, radiate, no. 371. *S. sotikensis* S. Moore; 13,000 ft., bush to 3 ft., very viscid, leaves pinnatifid, oblong; capitula radiate, yellow, no. 416.

Euryops.—*E. elgonensis* Mattf.; 12,800 ft., shrub to 4 ft., leaves linear, crowded, capitula radiate, yellow, no. 368; Aberdares.

Tripteris.—*T. Vaillantii* Decne.; 8700 ft., erect viscid herb to 2 ft., capitula radiate, yellow, achenes winged, no. 262; Abyssinia, Somaliland, Red Sea Hills to Gebel-Marra, Kenya Colony, Kilimanjaro, extending to Sinai.

Landtia.—*L. Rueppellii* (Sch. Bip.) Benth. et Hook. f. ex Vatke; 9000 ft., scapigerous rosette herb, leaves closely adpressed to soil, scapes 3 in., woolly, capitula radiate, yellow, no. 417; Abyssinia, Kilimanjaro, and probably also Kenya and Aberdares.

Berkheya.—*B. Spekeana* Oliv.; 6500–7500 ft., erect to 4 ft., leaves sessile, pungent-lobate, woolly below, setose-scabrid above, capitula radiate, yellow, no. 7; Cameroons Mt., Sudan, Uganda, and common on the mountains and plateaux of Kenya Colony and northern Tanganyika.

Echinops.—*E. amplexicaulis* Oliv.; 8000 ft., erect to 5 ft., leaves broad, elliptic, lobate-dentate, lobes spine-tipped, thinly woolly below, capitula in globose heads, flowers crimson, no. 82; Bongo, Uganda, southern Kenya Colony and Mbulu Distr. (Tanganyika). *E. eryngiifolius* O. Hoffm.; 6000 ft., erect to 3 ft., leaves linear, dense, parallel-nerved, margins densely spiny, flowers green, no. 553; Nandi Plateau, Bukoba Distr. *E. angustilobus* S. Moore; 8000 ft., erect to 5 ft., stems woolly at first, leaves pinnatipartite, lobes linear, spine-tipped, often again divided, woolly below, flowers greyish-white, nos. 81; 462; Kenya, Uasin Gishu and Mau Plateaux. *E. brevisetus* S. Moore; 6500–7500 ft., erect to 3 ft., stems woolly, leaves (the lower at least) very large, multipartite, lobes linear to linear-lanceolate, spine-tipped, woolly below, setose-scabrid above, no. 158; Ruwenzori southwards to Kigesi.

Carduus.—*C. nanus* R. E. Fries; 8500 ft., a rosette thistle with sessile heads of white to pale mauve or pale pink flowers, no. 406; Aberdares. *C. kikuyorum* R. E. Fries; 8000 ft., thistle, erect to 5 ft., flowers pale mauve, no. 257; mountains and high plateaux of Kenya Colony, Uganda and northern Tanganyika, westwards to Ruwenzori and the Virunga Mts. *C. leptacanthus* Fresen.; thistle, erect to 8 ft., leaves with very long spines, capitula congested, flowers purple, no. 191; Abyssinia, Ruwenzori, Ruanda. *C. keniensis* R. E. Fries, var. *elgonensis* R. E. Fries; 11,750–13,000 ft., thistle, basal rosette forming a cushion, flower shoots erect to 3 ft., with a large dense head of capitula, flowers mauve, the whole plant very densely spiny, no. 484.

Centaurea.—*C. rhizocephala* Oliv. et Hiern ; 6100 ft., perennial herb, 3 in., involucral bracts spine-tipped, flowers purple, no. 522 ; N. Nigeria, Bongo, Uganda, Kenya Colony, Nyasaland and Rhodesia.

Gerbera.—*G. abyssinica* Sch. Bip. ex A. Rich. ; 6700 ft., appearing in grassland after burning, scapigerous rosette herb about 1 ft. high, leaves rounded at the base, long petiolate, ray florets pink or red, disc white, no. 515 ; East Africa southwards to Portuguese E. Africa and westwards to Angola. *G. piloselloides* (Linn.) Cass. ; 6500–7500 ft., scapigerous rosette herb up to 20 in., scapes swollen towards the apex, leaves subsessile, narrowed to the base, ray florets pale purple or pink, disc white, nos. 218 ; 615 ; widely distributed in Africa, extending eastwards to Malaya and the Far East, and in Tasmania.

Crepis.—*C. carbonaria* Sch. Bip. ; 11,000 ft., small scapigerous herb, flowers yellow, Tweedie 26 ; Abyssinia, Athi Plains, Mt. Hanang.

Lactuca.—*L. taraxacifolia* Schum. et Thonn. ; 6500–7500 ft., erect to 2 ft., flowers mauve, no. 287 ; widely spread from Upper Guinea to Abyssinia, Uganda and Kenya Colony. *L. capensis* Thunb. ; 8000–11,400 ft., erect to 1 ft., flowers mauve, nos. 259 ; 336a ; 358 ; widely spread in Tropical and South Africa, and in Madagascar. *L. abyssinica* Fresen. ; 6500–7500 ft., erect to 8 ft., flowers mauve, no. 203 ; Abyssinia, Sudan, Niam-niam, Mittu, Uganda, Kenya Colony and probably also in southern Tropical Africa westwards to Angola.

Sonchus.—*S. oleraceus* Linn. ; 6500–7500 ft., erect to 2 ft., flowers yellow, no. 457 ; widely distributed in all warm and temperate regions. *S. Schweinfurthii* Oliv. et Hiern ; 6500–7500 ft., erect, 1–7 ft., cauline leaves sagittate-auriculate, flowers yellow, nos. 195 ; 546 ; Monbuttu, Uganda, Kenya Colony, Kilimanjaro, Nyasaland and westwards to Angola. *S. afromontanus* R. E. Fries ; 11,000 ft., subscapigerous herb with a head of capitula, outer bracts of the involucre tomentose with reddish-purple hairs, Tweedie 25. *S. Elliotianus* Hiern ; 6700 ft., flowers appearing before the leaves, immediately after burning of grasslands, 1–4 in. high, flowers yellow, no. 518 ; West Africa (Sierra Leone, Gold Coast, N. Nigeria), Sudan, Uganda, Tanganyika, Nyasaland and Katanga westwards to Angola.

Gentianaceae.

Sebaea.—*S. Schimperiana* Buching. ex Schweinf. ; 11,700 ft., erect to 8 in., flowers yellow, no. 415 ; Abyssinia, Aberdares. *S. leiostyla* Gilg ; 8000 ft., erect to 2 ft., flowers yellow, no. 41 ; Kenya, Aberdares, Upare and Pare Districts, and in Nyasaland.

Chironia.—*C. elgonensis* Bullock* ; 6500–7500 ft., in one swamp only, erect herb to 4 ft., flowers in large lax terminal cymes, crimson, no. 21 ; also at Kipkarren.

Swertia.—*S. kilimandscharica* Engl.; 11,400 ft., in shade, erect to 5 ft., flowers in lateral and terminal cymes, mauve, veined purple, no. 374; Aberdares, Kilimanjaro, Shira, Meru, Virunga Mts. *S. Lovenii* Th. Fries jr.; collected with the preceding, flowers and stems purple, no. 374a. *S. Sharpei* N. E. Br.; 7500 ft., in open swampy ground, erect to 14 in., flowers in terminal and lateral cymes, white, nos. 22; 46; Kenya Colony and Uganda southward to Nyasaland and Portuguese East Africa. *S. Lugardae* Bullock*; 11,800 ft., an erect rock plant up to 6 in. high, flowers white with purple stripes, no. 409; Aberdares. *S. uniflora* Mildbr.; 13,600 ft., stoloniferous rosette herb, peduncles leafy, up to 3 in., with a solitary dark purple or white flower, no. 377. *S. Dummeriana* Th. Fries jr.; stoloniferous rosette herb, peduncles about 2–6 in., leafy, 2–14-flowered, flowers lilac, veined purple, no. 414; the root is used medicinally by natives.

Primulaceae.

Lysimachia.—*L. africana* Engl.; 8250–11,500 ft., near water, herb to 18 in., flowers pale pink in dense terminal racemes, nos. 317; 318; Kenya Colony and Uganda, southwards to the Transvaal.

Anagallis.—*A. serpens* Hochst. ex DC.; 11,650 ft., a creeping bog plant, flowers axillary, pale pink, no. 325a; high mountains of East Africa southwards to Mt. Milanji.

Plumbaginaceae.

Plumbago.—*P. montis-Elgonis*, Bullock*; 6500 ft., herb of moist shady places, leaves decurrent to the auriculate base, inflorescence glandular, flowers magenta, no. 657.

Plantaginaceae.

Plantago.—*P. palmata* Hook. f.; 6600 ft., near water, rosette herb, leaves suborbicular, long-petiolate, palmatilobed, spikes raised on scapes about 9 in. high, no. 639; widely distributed on the mountains of Tropical Africa.

Campanulaceae.

Lightfootia.—*L. abyssinica* Hochst.; 6500–7500 ft., erect to 2 ft., flowers purple and white, no. 199; widely spread in eastern and southern Tropical Africa.

Wahlenbergia.—*W. arabidifolia* (Engl.) Brehm.; 11,600 ft., erect herb, 6–8 in., flowers pale blue, no. 322a; widely distributed in Tropical Africa.

Lobeliaceae.

Lobelia.—*L. Giberroa* Hemsl.; 8200 ft., erect to 18 ft., with milky latex, flower spike 5–6 ft. long, bracts not much longer than the mauve flowers, nos. 519; 1a; East African mountains westward to Ruwenzori and Virunga Mts. *L. Telekii* Schweinf.; 13,600 ft., erect to 5 ft., thick yellow latex, no leaves at the base, bracts ciliate, very much longer than the dark purple flowers, nos. 435; 436; Kenya, Aberdares. *L. aberdarica* R. E. et Th. Fries jr.; 9200 ft., near water, erect to 9 ft., bracts lanceolate-elliptic, short, flowers mauve, no. 434; Aberdares. *L. elgonensis* R. E. et Th. Fries jr.; 13,400–13,600 ft., a cabbage-like plant, no flower spike seen, no. 2a. *L. Lindblomii* Mildbr.; 10,300–13,600 ft., small creeping herb, flowers bright blue, nos. 432; 433. *L. stellarioides* Benth. et Hook. f.; spreading herb to 15 in., flowers buff, no. 469; East Africa. *L. fervens* Thunb.; 6500–7500 ft., spreading herb to 8 in., flowers blue, no. 149; widely spread in Tropical and South Africa.

Boraginaceae.

Ehretia.—*E. silvatica* Gürke; 6500–7500 ft., spreading shrub or tree up to 30–40 ft., flowers greenish-white in corymbose cymes, fruits orange-red, nos. 498; 554; 554a; Jackson 305a ("Minyan-uruwet"); widely spread in Kenya Colony, Uganda and Tanganyika.

Trichodesma.—*T. physaloides* (Fenzl ex Endl.) A. DC.; 6700 ft., erect herb to 18 in., flowers white, calyx bladder-like in fruit, no. 545; East Africa southwards to South Africa and westwards to Northern Nigeria.

Cynoglossum.—*C. coeruleum* Hochst. ex DC.; 9000 ft., branching herb, erect to 3 ft., flowers bright blue, no. 398; East Africa. *C. lanceolatum* Forsk.; 6500–7500 ft., erect herb to 18 in., flowers white with blue centre, no. 175; widely spread in Tropical Africa, and in South Africa, Orient, eastwards through India and Malaya to China and Japan.

Myosotis.—*M. sylvatica* Hoffm.; 11,700 ft., erect herb to 2 ft., flowers bright blue, no. 399; Abyssinia, Red Sea Hills, Aberdares, southwards to Livingstone Mts., and in South Africa, and westwards to the Cameroons Mt., also in Europe, Western Asia and Canary Is.

Lithospermum.—*L. officinale* Linn.; 11,400 ft., shrub to 3 ft., flowers pale yellow, pyrenes white, shining, no. 376; eastern Africa, and widely spread in the north temperate zone.

Solanaceae.

Discopodium.—*D. penninervium* Hochst.; 9000 ft., shrub to 8 ft., flowers grey, in axillary fascicles, no. 426; widely spread in East Africa, extending westward to Virunga Mts., Cameroons Mt. and Fernando Po, and southwards to Nyasaland.

Physalis.—*P. peruviana* Linn.; 6700 ft., cultivated ground and in the bush, spreading, to 3 ft., flowers yellow, bladder-like fruiting calyx brown, no. 641 (Cape Gooseberry); widely distributed, native of South America, and now naturalised in many parts of Tropical and South Africa.

Solanum.—*S. panduriforme* E. Mey.; 6500–7500 ft., shrub to 8 ft., leaves and stems densely stellate-tomentose, old wood thorny, flowers large, mauve, fruit yellow, 1½ in. diam., no. 90; Uganda and Kenya Colony southwards to Portuguese East Africa, westwards to Angola, and in South Africa. *S. nigrum* Linn.; 6500–7500 ft., and 11,800 ft., spreading herb to 3 ft., flowers small (the specimen from the higher altitude (no. 492) has very large flowers for this species), white, in small extra-axillary racemes, leaves ovate, acuminate, entire to deeply dentate, thinly pubescent with simple hairs, nos. 209; 492; widely spread as a weed in warm and temperate regions. *S. indicum* Linn.; 6500–7500 ft., erect to 5 ft., armed with recurved prickles, leaves more or less lobulate-sinuate, densely stellate-pubescent, flowers small, white, fruits red, the size of a pea, no. 291; widely spread throughout the Old World tropics, extending to the Philippines. *S. aculeastrum* Dunal; 7200 ft., spreading shrub to 20 ft., armed with stout straight or recurved prickles, leaves lobate-sinuate, white-stellate-tomentose below, glabrescent above, flowers white, about 1 in. diam., fruit lemon-shaped and lemon-yellow, no 238; Uganda, Kenya Colony southwards to South Africa, and westwards to Angola. *S.* sp.; 8000–9000 ft., erect to 3 ft., strongly armed with straight prickles, flowers large, rich purple, no. 35; this may represent an undescribed species.

Convolulaceae.

Ipomoea.—*I. blepharophylla* Hall. f.; 6500–7500 ft., a twining herb with white and purple flowers 2 in. long, leaves narrowly lanceolate, 2 in. long, no. 73; widely distributed in Tropical Africa. *I. tenuirostris* (Steud. MS.) Choisy; 6500–7500 ft., twining herb, flowers white with a purple centre, 1½ in. long, leaves broadly ovate, deeply cordate at the base, no. 189; East Africa and Nyasaland. *I. Wightii* (Wall.) Choisy; 6500 ft., twiner with milky latex, flowers mauve, 1½ in. long, in rather congested cymes raised on peduncles about 6 in. long, leaves ovate, cordate at the base, white-tomentose below, no. 290; East and South Africa, Madagascar and Tropical Asia. *I. cairica* (Linn.) Sweet; 6500–7500 ft., ground creeper, leaves digitately divided almost to the base, flowers mauve, 1½ in. long, no. 297; widely spread in the tropics of both hemispheres, and in Egypt and South Africa. *I. pachypus* Pilger; 6700 ft., dwarf ground creeper, leaves deeply palmately divided into linear segments, flowers solitary, purple, 1½ in. long, shortly stalked, no. 590; described from a Somaliland specimen (Ellenbeck 1209). This was determined by Prof. R. Pilger, to whom the writer is indebted.

Convolvulus.—*C. sagittatus* Thunb. var. *abyssinicus* (Hall. f.) Baker et Rendle; 6500–7500 ft., a twining herb with rather small pink flowers, no. 168; an extremely polymorphic variety widely distributed in East Africa, Nyasaland and westwards to Angola, and in N. Nigeria; the leaves are always deeply sagittate.

Cuscuta.—*C. kilimanjari* Oliv.; 6500 and 7200 ft., twining parasite on *Hypoestes verticillaris* (see below), with crimson stems and cream or yellow flowers, nos. 514; 583; found on various species of Acanthaceae on the mountains and plateaux of Kenya Colony southwards to the Livingstone Mts.

Scrophulariaceae.

Celsia.—*C. brevipedicellata* Engl.; 6500 ft. (?), erect herb to 4 ft., flowers yellow, no. 13; Kilimanjaro, Meru, Mbulu and Karagwe Districts. *C. scrophulariifolia* Hochst. ex A. Rich.; 11,800 ft., erect herb to 3 ft., flowers yellow, no. 491; Abyssinia, Kenya Colony and westwards to Ruwenzori.

Halleria.—*H. lucida* Linn.; 8500 ft., tree to 20 ft., flowers orange, fruits green, fleshy, nos. 341a; 496; Abyssinia southwards to South Africa and westwards through Nyasaland to Angola.

Craterostigma.—*C. plantagineum* Hochst.; 6500–7500 ft., on rocks, rosette herb, flowers deep purple-mauve to almost white, several on a scape or apparently solitary on slender pedicels, nos. 160; 160a; widely spread from Abyssinia, Eritrea and Arabia southwards to the Transvaal and westwards through Nyasaland and Rhodesia to Angola.

Lindernia.—*L. lobelioides* (Oliv.) Engl.; 6500–7500 ft., in swampy ground, erect *Lobelia*-like herb with purplish blue flowers (rarely pure white), no. 148; Abyssinia and the Sudan southwards to Nyasaland.

Ilysanthes.—*I. pusilla* (Oliv.) Urban; 6900 ft., on rocks, erect herb about 1½ in., flowers pinkish-mauve, no. 652; Karagwe, Chagwe, Ngong, Kipkarren.

Veronica.—*V. abyssinica* Fresen.; 7000–8000 ft., erect herb, flowers blue, in axillary racemes, no. 47; Abyssinia and the East African mountains and plateaux southwards to the Livingstone Mts., and westward to the Virunga Mts. and Cameroons Mt. *V. myrsinoides* Oliv.; 11,800 and 12,000 ft., creeping herb, flowers solitary, axillary, pale blue, young parts glandular, nos. 396; 412; 486; Kilimanjaro and Shira Mts., and probably also Kenya and Aberdares. *V. glandulosa* Hochst. ex Benth.; 13,000–13,500 ft., glandular herb, Tweedie 68; Abyssinia, Ruwenzori, Virunga Mts., and probably also on the Aberdares.

Alectra.—*A. asperrima* Benth.; 6500–7500 ft., erect herb to 16 in., flowers yellow, leaves scabrid, no. 102; Abyssinia and Eritrea, Kenya, Nandi Plateau, E. Kilimanjaro.

Cycniopsis.—*C. obtusifolia* Skan; 6500–7500 ft., ground creeper, flowers with a long narrow tube bent at the top, and spreading limb about 1 in. diam., pink, with a more uncommon white form, no. 3 ; Nairobi, Nandi, Eldoma Ravine, Kikuyu.

Rhamphicarpa.—*R. tenuisecta* Standley ; 9500–11,000 ft., creeping herb, leaves pinnatisect, segments filiform, flowers pink, fruits with a curved beak, no. 349; mountains and plateaux of Kenya Colony. *R. Jamesii* Skan ; 6000 ft., in a swamp (one place only) erect to 2½ ft., leaves linear, subentire, 4 in. or more long, flowers pure white, subsessile in the axils of the reduced upper leaves, no. 444 ; Kavirondo, Unyoro, Nyanza basin on the Kenya Colony and Tanganyika sides. *R. Herzfeldiana* Vatke ; 6500–7500 ft., erect or climbing to 4 ft., leaves broadly ovate, dentate, flowers cream flushed with pink, long-pedicellate, scattered, in the axils of normal leaves ; no. 4 ; grasslands of Kenya Colony, Uganda, and northern Tanganyika. *R. Heuglinii* Hochst. ex Schweinf. ; 6500–7500 ft., in swampy ground (in one place only), ground creeper, leaves linear, distantly toothed, flowers pale pink or white, long-pedicellate ; no. 139 ; East Africa and the Sudan, and probably also in the Shire Highlands.

Cycnium.—*C. adonense* E. Mey. ex Benth. ; 6100 ft., ground creeper, flowers with a long hairy tube 2½ in. long, limb spreading, 2 in. diam. pale yellow and brick red in bud, pure white when fully open, turning pale mauve and finally black, no. 568 ; a very variable plant extending from the Sudan, Uganda, and Kenya Colony southwards through Portuguese East Africa and Rhodesia to South Africa.

Sopubia.—*S. trifida* Buch.-Ham. ex Don ; 7000–8000 ft., erect herb to about 18 in., leaves trifid, segments linear, flowers yellow, no. 48 ; widely distributed in the tropics of the Old World, extending to Australia. *S. ramosa* (Hochst.) Hochst. ; 6500–7500 ft., erect somewhat scabrid undershrub to 3 ft., leaves linear, whorled, flowers purple, pink, or white with a deep purple spot at the base of each lobe, nos. 61 ; 131 ; widely distributed throughout Tropical Africa.

Bartsia.—*B. abyssinica* Hochst. ex Benth. ; 6500–8500 ft., erect to 4 ft., somewhat scabrid, flowers white tinged with pink, or purple and white, nos. 53 ; 140 ; 693 ; Abyssinia. *B. Petitiana* (A. Rich.) Hemsl. ; 12,000 ft., erect herb to 1 ft., flowers mauve-pink, nos. 326 ; 412a ; high grasslands of East Africa. *B. similis* Hemsl. ; 11,800 ft., glandular shrub to 3 ft., flowers pale yellow, no. 490 ; Aberdares, Kilimanjaro, Ruwenzori, Virunga Mts. *B. kilimandscharica* Engl. ; 12,000 ft., shrub to 4 ft., flowers greenish-yellow, no. 367 ; Kenya, Kilimanjaro, Shira Mts.

Acanthaceae.

Thunbergia.—*T. alata* Boj. ex Sims ; 6500–9000 ft., twining herb with solitary long pedicellate axillary lemon, orange, russet or pink flowers, leaves more or less sagittate-ovate, petiole winged or wingless, nos. 52 ; 201 ; widely distributed in all warm regions, and often cultivated. *T. Paulitschkeana* G. v. Beck. ; 6700 ft., trailing or climbing herb, flowers orange, very like the preceding, but leaves not sagittate, no. 551 ; Somaliland, Elburgon, Mau.

Hygrophila.—*H. longifolia* (Linn.) Kurz ; 6500–7500 ft., erect herb to 18 in., leaves linear-lanceolate, flowers in dense whorls, blue, some of the bracts reduced to stout spines ; no. 182 ; widely distributed in Tropical Africa, India and Ceylon.

Ruellia.—*R. patula* Jacq. ; 6500–7500 ft., dwarf, procumbent or ascending, flowers in small cymes or apparently solitary, pale purple or mauve, nos. 186 ; 543 ; widely distributed in Tropical Africa.

Mimulopsis.—*M. spathulata* C. B. Clarke ; 8000 ft., erect to 6 ft., flowers white, tinged purple, funnel-shaped, 1 in. long, in lax terminal leafy panicles, no. 42 ; Mau Plateau, Mengo, Toro.

Acanthus.—*A. pubescens* (Oliv.) Engl. ; 7100 ft., in fairly open situations, shrub to 8 ft., leaves very spiny, flowers in terminal panicles of spikes, mauve-pink ; no. 233 ; Kenya Colony, Uganda, N. Tanganyika. *A. eminens* C. B. Clarke ; 6500 ft., in dense shade of forest, shrub to 10 ft., leaves spiny, flowers in spikes as above, rich purple-blue, no. 232 ; mountains and plateaux of Kenya Colony.

Barleria.—*B. grandicalyx* Lindau; 6100–7500 ft., erect to 18 in., flowers purple or mauve, solitary, one calyx-segment much enlarged, nos. 68 ; 71 ; 526 ; probably widely distributed in eastern Tropical Africa, extending westwards to Angola. *B. Stuhlmannii* Lindau ; 6500–7500 ft., shrub to 12 ft., flowers mauve, no. 130 ; Kenya Colony, Uganda, northern Tanganyika.

Justicia.—*J. flava* Vahl ; 6500–7500 ft., erect to 6 ft., flowers yellow, in terminal spikes ; no. 142 ; widely distributed in Tropical Africa. *J. pinguior* C. B. Clarke ; 6500–7500 ft., erect to 2 ft., flowers purple in distant whorls, no. 27 ; subtropical forests of Kenya Colony westwards to Ruwenzori. *J. striata* (Klotzsch) Bullock* ; 7000 ft., erect to 1 ft., flowers pink, in axillary cymes, no. 242 ; Kenya Colony westwards to Ruwenzori, and southwards to Nyasaland, and again westward to Angola. *J. Anselliana* (Nees) T. Anders. ; 6500–7500 ft., ground creeper with erect sterile shoots, flowers white, in small long- or short- pedunculate cymes. Nos. 34 ; 206 ; widely distributed in Tropical Africa.

Hypoestes.—*H. triflora* (Forsk.) Roem. et Schultes ; 9000 and 10,000 ft., in shade of heavy forest, spreading carpet herb to 12 in., flowers pale mauve, nos. 410 ; 410a ; East Africa westwards to the Cameroons Mt., and extending eastwards to India. *H. verticillaris* (Linn. f.) R. Br. ; 6500–7500 ft., erect to 3 ft., inflorescence paniculate, flowers white with lilac marks, nos. 78 ; 514 (parasitised by

Cuscuta kilimanjari); widely distributed in Tropical and South Africa, and in Arabia and Socotra.

Selaginaceae.

Hebenstreitia.—*H. dentata* Linn.; 10,200–13,500 ft., shrub to 2 ft., leaves linear, flowers spicate, white with orange throat, nos. 373; 373a; 373b; East Africa southwards to South Africa, and westwards through Nyasaland to Angola.

Verbenaceae.

Lantana.—*L. salviifolia* Jacq.; 5900–7500 ft., in open situations, shrub, 5 ft., leaves opposite or ternate, flowers white or mauve, in short long-pedunculate axillary spikes, nos. 103; 103a; widely distributed in Tropical and South Africa, and in India.

Lippia.—*L. adoensis* Hochst. ex Schauer; erect to 6 ft., leaves opposite, ternate or quadrate, very scabrid, flowers pale yellow, in subglobose shortly pedunculate axillary spikes, no. 109; widely distributed in Tropical Africa.

Clerodendron.—*C. rotundifolium* Oliv.; 6500 ft., spreading pubescent shrub to 5 ft., flowers white, in terminal cymes, corolla-tube about 4 in. long, slender, no. 456; Kenya Colony and Uganda westwards to Ruwenzori and the Virunga Mountains, southwards to Nyasaland and westwards to Angola. *C. ugandense* Prain; 6500–7500 ft., glabrous shrub to 10 ft., flowers in terminal panicles, intensely blue to pale bluish-white, corolla-tube very short, no. 1; Kenya Colony and Uganda.

Labiatae.

Geniosporum.—*G. paludosum* Baker; 6500–7500 ft., erect herb, leaves ovate, densely rusty pubescent, uppermost (floral) leaves white or purple, flower-whorls forming dense cylindrical spike-like panicles, flowers pale purple, no. 30; grasslands of Uganda and Kenya Colony southwards to Nyasaland and Rhodesia, and westwards to Angola, and in N. Nigeria westwards to Sierra Leone.

Acrocephalus.—*A. caeruleus* Oliv.; 6500–7500 ft., erect herb about 15 in., leaves linear-lanceolate, flower-heads corymbose, floral leaves white, flowers blue or white, nos. 91; 92; grasslands of Uganda and Kenya Colony southwards to Nyasaland, Northern Rhodesia and Katanga.

Becium.—*B. obovatum* (E. Mey.) N. E. Br.; 6500–7500 ft., erect herb to 2 ft., leaves glabrous, entire, lanceolate to obovate-oblanceolate, flowers purple, stamens long-exserted, calyx enlarged in fruit, lower lip with 2 spiny teeth, nos. 25; 93; Kenya Colony, Uganda and Tanganyika, southwards to South Africa.

Hoslundia.—*H. opposita* Vahl; 6500 ft., aromatic shrub to 2 ft. (attains 10–15 ft.), flowers greenish white in lax terminal panicles, fruit-calyx globose, red, edible, no. 628; widely distributed in Tropical and South Africa, and in Madagascar.

Plectranthus.—*P. silvestris* Gürke; 6500–7500 ft., herbaceous, 6–8 ft., flowers blue, no. 151; Kenya, Aberdares, Kilimanjaro and Nyasaland. *P.* sp.; 6100 ft., erect herb to 18 in., flowers pure white, no. 566.

Coleus.—*C. Forskohlii* (Willd.) Briq.; 6500–7500 ft., shrub to 10 ft., young stems and leaves fleshy, velvety-pubescent, flowers whorled, in terminal raceme-like panicles, brilliant blue, no. 150; East Africa and the Sudan, and in Arabia. Two further species of this genus were also collected with the following notes:—6500–7500 ft., erect to 8 ft., flowers pale mauve, no. 214; 8500 ft., erect to 4 ft., flowers purple-blue, no. 268.

Aeolanthus.—*A. heliotropioides* Oliv.; 6500–7500 ft., near rocks, a slightly pubescent erect herb, flowers light mauve, in panicles of one-sided spikes, calyx circumcissile in fruit, no. 446; Kenya Colony and Uganda, westwards to N. Nigeria. *A. repens* Oliv.; 6500–7500 ft., a densely pubescent herb creeping over rocks, flowers arranged as above, on shoots up to 1 ft. high, flowers purple, bracts, etc., purplish-mauve, much more glandular than in the preceding, nos. 29; 84; Kenya Colony and Uganda westwards to the Virunga Mts., and Bukoba.

Pycnostachys.—*P. deflexifolia* Baker; 6500–7500 ft. erect to 4 ft., inflorescence solitary spiciform, flowers pale mauve, calyx-teeth produced into prickles in fruit, no. 134; hills and plateaux surrounding Lake Victoria, and Lake Elmeteita. *P.* sp.; 6500–7500 ft., in one swamp (abundant), erect to 3½ ft., inflorescence paniculate, spiciform, flowers sky blue, no. 19.

Micromeria.—*M. abyssinica* Benth.; 6500–7500 ft., erect to 4 ft., leaves ovate, crenate, petiolate, flowers pale purple in slender raceme-like panicles, no. 125; East Africa and Arabia. *M. biflora* Benth.; 10,000 ft., virgate shrublet, 18 in., leaves entire, ovate, subsessile, flowers mauve, in crowded axillary cymes, no. 303a, widely distributed in Tropical and South Africa, extending to India.

Calamintha.—*C. simensis* Benth.; 8000 ft.,. semi-procumbent aromatic herb, flowers purple, in whorls, no. 40; East African highlands, Virunga Mts., Cameroons Mt and Fernando Po. *C. elgonensis* Bullock*; 12,000 ft., aromatic, erect to 3 ft., woody, flowers mauve, no. 364. *C. kilimandschari* Gürke; 13,000–13,500 ft., herb to 6 in. high, Tweedie 3; Kilimanjaro, Shira Mts., Kenya, Aberdares.

Salvia.—*S. nudicaulis* Vahl; aromatic rosette herb to 1 ft., basal leaves linear-oblong, long petiolate, rugose above, softly pubescent below, flowers blue-mauve, no. 307a; Eritrea, Somaliland, Abyssinia, Aberdares, Kenya, Mau, and in Arabia. *S. nilotica* Vahl; 8000–8500 ft., aromatic herb like the last, to 3 ft., lower leaves lyrate, flowers purple, no. 55; 294; East Africa, southwards to Rhodesia.

Nepeta.—*N. azurea* R. Br. ex Benth.; 10,100 ft., bushy, aromatic, to 5 ft., leaves rugose above, densely white-pubescent below, flowers rich purple, in narrow spiciform terminal panicles, no. 466; Abyssinia, Kenya Colony.

Scutellaria.—*S. paucifolia* Baker; 6500–7500 ft., erect herb to 10 in., flowers purple (when growing in burnt grassland, the leaves on the flowering shoots are reduced, and may be entirely wanting), no. 69; widely distributed in the grasslands of Tropical Africa.

Leucas.—*L. tricrenata* Bullock*; 8600 ft., thinly pilose semi-procumbent spreading herb, to 12 in., leaves small, obovate, 3-toothed near the apex, flowers white, in two or three whorls, no. 471; Nandi Forest. *L. calostachys* Oliv.; 6500–7500 ft., densely pubescent herb, erect to 2 ft., leaves obovate to suborbicular, crenate in the upper half, flowers white, whorls numerous, spiciform, no. 74; Nandi westward through Uganda, then southward to Karagwe (Bukoba).

Leonotis.—*L. velutina* Fenzl.; 6500–7500 ft. (very common), erect to 12 ft., flowers orange or deep salmon, in distant large many-flowered whorls, no. 113; East Africa southward to Nyasaland, Rhodesia southern Belgian Congo.

Tinnea.—*T. aethiopica* Kotschy et Peyr.; 6500 ft. (uncommon at this altitude) erect shrub to 8 ft., flowers solitary, axillary, deep maroon, fruit calyx bladder-like, no. 452; Sudan, Kenya Colony, Uganda westwards to N. Nigeria and southwards to Nyasaland.

II.—*Monocotyledones*.†

Alismataceae.

Alisma.—*A. Plantago-aquatica* Linn.; 6400 ft., an erect pond weed, up to 2½ ft. above the water surface, flowers paniculate, white, no. 532; widely distributed, but absent from South America.

Liliaceae.

Asparagus.—*A. racemosus* Willd.; 6000 ft., spreading, to 4 ft., thorny, flowers racemose, green, no. 506; widely distributed in Tropical Africa, and in Tropical Asia. A further specimen of this genus, no. 488, was collected at 11,800 ft.; it is thornless, and near to *A. africanus* Lam., but it cannot be determined accurately without flowers.

Dracaena.—*D. fragrans* (Linn.) Gawl.; 6500–7500 ft., tall lily-like plant 6–8 ft., flowers reddish-mauve (to white or orange), Jackson

---

† Arranged approximately according to the system to be proposed by Mr. J. Hutchinson in the second volume of his *Families of Flowering Plants*.

338 ("Nasabombiondet"); widely distributed in Tropical Africa, and attaining 20–30 ft. in height.

Kniphofia.—*K. Snowdenii* C. H. Wright; 6500–13,000 ft., erect "Red-hot poker" plant 2–10 ft., decreasing in size with increasing altitude, flowers yellow to red, perianth scaly-pubescent outside, Nos. 83; 431; 431a. *K. Thomsoni* Baker; 12,000–13,000 ft., in moist ground, herb 2–3 ft., flowers glabrous, Tweedie 104; Kenya Colony, Kigezi, Kilimanjaro.

Aloe.—*A. elgonica* Bullock*; 6500–7500 ft., erect to 4 ft., flowers orange-scarlet, capsules brown, no. 299.

Eriospermum.—*E. abyssinicum* Baker; 6600 ft., large bulb, flowers yellowish-green, before the leaves, racemes erect to 8 in., no. 562; East Africa southwards to S. Rhodesia, and westwards through the Sudan to N. Nigeria.

Bulbine.—*B. asphodeloides* (Linn.) Schultes f.; 6500 ft., bulbous, erect to 9 in., leaves linear, flowers bright yellow, in a dense raceme, no. 591; East Africa and the Sudan southwards to Nyasaland and Portuguese East Africa, and widely distributed in S. Africa.

Anthericum.—*A. uyuiense* Rendle; 6400 ft., bulbous herb, erect to 12 in., flowers racemose, white, leaves linear, with purple spots at the base, no. 636; Bunyoro, and in Tanganyika Territory. *A. speciosum* Rendle; 6500–7500 ft., erect bulbous herb to 2 ft., flowers racemose, dull white, no. 28; also in Uganda, Jur-land, and N. Nigeria; this differs from the type in the spotted leaf base and rather narrower leaf. *A. angustifolium* Hochst. ex A. Rich.; 6500 ft. bulbous herb, flowers 2–3 in., a sessile corymb, white with green veins, leaves narrowly linear, up to 5 in. long, no. 592; Abyssinia, Aberdares.

Chlorophytum.—*C. gallabatense* Schweinf. ex Baker; 6300 ft., bulbous herb with spreading panicle of greenish-white flowers 2 ft. high, leaves narrowly lanceolate, about 18 in. long, no. 630; East Africa southwards to Nyasaland and Portuguese East Africa, and westwards to the central Chari region. *C. ciliatum* Baker; 6750 ft., panicles erect to 7 in., flowers green, leaves rather broadly lanceolate, ciliate, up to 6 in. long, no. 559; Nandi, Jur-land, Central Chari, N. Nigeria and Sierra Leone. *C. elgonense* Bullock*; 6500 ft., bulbous herb to 8 in., flowers white, leaves oblong-lanceolate, panicles simple or slightly branched, no. 629.

Drimia.—*D. congesta* Bullock*; 8700 ft., bulbous herb to 3 ft., leafless at flowering time, racemes cylindrical, congested, flowers cream with mauve lines, no. 474. *D. elgonica* Bullock*; 6700 and 6900 ft., erect bulbous herb to 3 ft., leafless at flowering time, racemes lax, flowers dirty white with mauve throat, nos. 563; 569.

Albuca.—*A. Wakefieldii* Baker; 6500–7500 ft., bulbous herb about 1 ft. high, racemes lax, flowers green or yellowish green, leaves broadly linear, about 1 ft. long, nos. 88; 443; 560; East Africa, Nyasaland, Rhodesia.

Urginea.—*U. altissima* (Linn. f.) Baker; 6900 ft., bulbous herb, erect to 6½ ft., racemes very long, pedicels up to 1 in. long, flowers white with maroon stripes outside, no. 558; widely distributed in Tropical and South Africa, excluding Abyssinia, Somaliland, etc. *U. porphyrantha* Bullock*; 6500 ft., bulbous herb about 6 in., flowers maroon, no. 556.

Ornithogalum.—*O. gracillimum* R. E. Fries; 6600 ft., small bulbous herb to 4 in., leaves linear-filiform, flowers few on a slender peduncle, white, no. 561; Kenya, Mau.

Scilla.—*S. indica* Baker; 6600 ft., erect bulbous herb to 15 in., racemes long and slender, leaves puce-spotted, flowers puce, no. 557; eastern Tropical Africa, and in Peninsular India and Ceylon.

Androcymbium.—*A. melanthioides* Willd.; 6600 ft., a bulbous herb about 3 in., flowers white, surrounded by green-veined white bracts, no. 555; Abyssinia southward through Kenya Colony, Tanganyika, Portuguese East Africa, Nyasaland and Rhodesia to the Cape.

Gloriosa.—*G. virescens* Lindl.; 6500 ft., twining, leaves with a long circinnately curled acumen (tendril), flowers large, yellow and red, no. 63; widely distributed in Tropical Africa and in Natal and Madagascar.

Dioscoreaceae.

Dioscorea.—*D. Schimperiana* Hochst. ex Kunth; 6500–7500 ft., a creeper or twiner, leaves cordate-ovate with reticulate venation, no. 453; widely distributed in Tropical Africa. *D. Quartiniana* A. Rich.; 6500 ft., twining trailer, leaves palmately 3–5-foliolate, flowers (♂) cream in bracteate axillary spikes 1–2 in. long, no. 674; widely distributed in Tropical Africa.

Amaryllidaceae.

Haemanthus.—*H. multiflorus* Martyn; 6000–7000 ft., bulbous herb about 1 ft., flowers scarlet, very numerous, in a dense globose umbel up to 8 in. diam., no. 578; East Africa westwards to Sierra Leone, etc., and southwards to Delagoa Bay.

Crinum.—*C. heterostylum* Bullock*; 7700 ft., bulbous herb up to 9 in., with flat ribbon-like leaves, scape flattened, bearing an umbel of 5–10 straight, narrowly tubular flowers about 3 in. long, with lanceolate segments about 1 in. long, flowers at first white or cream, becoming pink later, no. 421. *C. Kirkii* Baker; 6500–7500 ft. (?), bulbous herb to 3 ft., flowers tubular, curved, tube 4 in. or more, limb bell-shaped, up to 4 in. long, white with broad keels of bright red, no. 579 ; Kenya Colony, Uganda and Tanganyika.

Hypoxidaceae.

Hypoxis.—*H. multiflora* Nel ; 6700 ft., erect to 9 in., flowers (before leaves) racemose, numerous, peduncle stout, bright yellow, no. 550. *H. urceolata* Nel ; 6800 ft., erect to 8 in., leaves long, linear, flowers racemose, few, on a slender peduncle, bright yellow, no. 597 ; Uganda, Tanganyika Territory (Ufiume Mt.).

Iridaceae.†

Morea.—*M. Thomsoni* Baker ; 6750 ft., erect herb to 9 in., flowers mauve, no. 573 ; Kenya Colony southwards to Nyasaland. *M. Carsoni* Baker ; 6600 ft., erect herb to 2 ft., flowers purplish-blue, said to be very poisonous to stock, no. 548 ; Kenya Colony southwards to Nyasaland.

Romulea.—*R. ramiflora* Ten. ; 13,600 ft., erect herb, 6 in., from a small globose corm, flowers plain mauve, no. 308a ; Mediterranean Region and Abyssinia. *R. Fischeri* Pax ; erect herb, 2 in., from a small globose corm, flowers mauve-blue with yellow centre, no. 352 ; Kinangop, Abori, and the Uganda side of Mt. Elgon.

Aristea.—*A. alata* Baker ; 8700 ft., erect herb to 3 ft., peduncle winged, flowers purple-mauve, no. 475 ; East Africa.

Dierama.—*D. vagum* N. E. Br. ; 11,500 ft., erect herb to 4 ft., inflorescence branches slender, wiry, flowers mauve, pendulous, nos. 337 ; Kenya.

Gladiolus.—*G. Quartinianus* A. Rich. ; 6500–11,500 ft., erect herb 2½–6 ft., flowers large, spicate, buff-yellow, salmon or scarlet, nos. 10 ; 280 ; 584 ; an extremely polymorphic species, widely distributed in Tropical Africa.

Musaceae.

Musa.—*M. Ensete* Gmel. (?) ; 6500 ft., erect to 15 ft., leaves up to 15 ft., nos. 646a ; 646b ; Abyssinia, Niamniam, Monbuttu, Uganda and probably also in the Karagwe and Kilimanjaro districts of Tanganyika. In the absence of seeds, it is impossible to identify the species with certainty, though the locality indicates the above determination.

Hydrocharitaceae.

Hydrilla.—*H. verticillata* (Linn. f.) Royle ; 6400 ft., pond weed on surface of water, flowers white, no. 534 ; widely distributed, but absent from America.

---

†A further Iridaceous plant which occurs on Mt. Elgon, and for which Major Lugard searched but was unable to find, is *Oenostachys dichroa* Bullock, which flowers in August at an altitude of about 10,000 ft. The rather small green and white flowers are almost completely hidden by the large, brightly coloured bracts.

Commelinaceae.

Commelina.—*C. nudiflora* Linn.; 6500–7500 ft., weak rambling herb with ovate leaves and blue flowers, no. 213; a weed of tropical and warm temperate regions. *C. imberbis* Hassk.; 6500–7500 ft., weak spreading herb to 2 ft., leaves long, linear-lanceolate, flowers blue, no. 213a; East and South Tropical Africa, extending to Madagascar. *C. africana* Linn.; 6500–7500 ft., spreading herb to 2 ft., leaves ovate, flowers yellow, no. 212; widely distributed in Tropical and South Africa, and in the Mascarene Islands. *C. elgonensis* Bullock*; 6700 ft., appearing after grass fires, erect viscid herb to 6 in., leaves ovate-lanceolate, flowers long-pedicellate, bluish-mauve, no. 549. *C. Lugardii* Bullock*; 8000 ft., trailing herb rooting at the nodes and throwing up erect flowering shoots, leaves linear-subulate, flowers buff-orange, no. 145.

Aneilema.—*A. sinicum* Lindl.; 6500 ft., erect herb to 2 ft., flowers paniculate, bluish-mauve, nos. 455; 619; widely distributed in Tropical and South Africa, extending through Asia to southern China.

Cyanotis.—*C. hirsuta* Fisch. et Mey.; 8500 and 11,500 ft., creeping or suberect bog plant, leaves oblong-lanceolate, flowers purple or magenta and blue, in heads, nos. 269; 378; East Africa and probably also in Nyasaland. *C. lanata* Benth.; 6500–7500 ft., on rocks, a lanate creeping or suberect herb, stems purple, leaves ovate to oblong-lanceolate, flowers purple, in heads, no. 118; widely distributed in Tropical Africa.

Orchidaceae. (V. S. Summerhayes).

Holothrix.—*H. elgonensis* Summerh.*; 10,200 and 10,500 ft., erect to 12 ins., flowers small, white with pink flush, leaves basal, adpressed to ground, nos. 379; 379a.

Brachycorythis.—*B. grandis* Kraenzl. var. *ugandensis* Braid; erect, glabrous, leafy, to 18 in. with mauve flowers, no. 661; also on the Uganda side of Mt. Elgon. *B. Kassneriana* Kraenzl.; 6700 ft., erect, leafy, to 18 in. with softly velvety leaves and mauve flowers, Tweedie 14; Uganda southwards to Nyasaland, N.W. Rhodesia and Angola.

Habenaria.—*H. macrura* Kraenzl.; 6700 ft., erect to 18 ins., 2 oval basal leaves, flowers green and white, scented, Tweedie 32; westwards to N. Nigeria and southwards to Livingstone Mts., N. Rhodesia and Angola. *H. malacophylla* Rchb. f.; 6700 ft., erect to 2½ ft., leaves broad, flowers small, green, Tweedie 26; general in forests throughout Tropical Africa, southwards to Natal and E. Cape Province. *H. splendens* Rendle; 6700 ft., erect to 18 in., flowers green and white, large, lip fimbriate, faintly scented, Tweedie 17; Uganda side of Mt. Elgon, Kenya, southwards to Nyasaland. *H. ruwenzoriensis* Rendle; 6700 ft., erect to 18 in., flowers green, Tweedie 18; N. Nigeria, Ruwenzori. *H. Walleri* Rchb. f.; 6700 ft., erect to 3 ft., flowers large, white and green, in few flowered spikes, spur very long, scented, Tweedie 9; general in grasslands and swamps in Tropical Africa. *H. Tweedieae* Summerh. MS.; 6700 ft., erect to 2 ft., flowers greenish in a rather dense spike, bracts and flowers somewhat hairy, Tweedie 25. *H. Hochstetteriana* Kraenzl.; 6700 ft., erect, 6–14 in., flowers small, greenish-white, leaves narrow, Tweedie 13; Abyssinia, Kenya, Uganda side of Mt. Elgon, N. Tanganyika. *H. ingrata* Rendle; 6700 ft., erect to 12 in., flowers green, tubers 1 in. long, no. 110; Ruwenzori. *H. limnophila* Summerh.; 6500 ft., erect to 3 ft., flowers white and green, spreading, no. 673; Kenya Colony, Uganda, N. Tanganyika, and westwards to N. Nigeria. *H. Linderi* Summerh.; 8500 ft., erect to 16 in., flowers green, erect, no. 270; western Uganda. *H. Petitiana* (A. Rich.) Dur. et Schinz; 6700 ft., erect, 8–12 in., leaves ovate, flowers very small, green, in narrow spike, Tweedie 21; Abyssinia, Uganda side of Mt. Elgon.

Platycoryne.—*P. montis-Elgon* (Schlect.) Summerh.*; 6600 ft., erect ground orchid to 8 in., flowers clustered, bright orange, no. 647; also on the Uganda side of Mt. Elgon.

Disa.—*D. concinna* N. E. Br.; 7000 ft., erect ground orchid to 15 in., flowers pale mauve, pink or purple, no. 594; E. Uganda and Kenya Colony, southwards to Nyasaland and Rhodesia. *D. Stairsii* Kraenzl.; 10,300 ft., erect, to 18 in., flowers pink, Tweedie 29; Virunga Mts., Ruwenzori, Kilimanjaro, Uluguru Mts.

Satyrium.—*S. Carsoni* Rolfe; 6600 ft., erect, with large white flowers and basal leaves appressed to ground, no. 670; Uganda and N. E. Rhodesia. *S. crassicaule* Rendle; 8250 ft., in streams, erect to 4 ft., flowers bright pink, leaves basal, erect, no. 424; Kenya, Ruwenzori and Virunga Mts., and widely distributed in Tanganyika. *S. sceptrum* Schlect.; 8600 ft., erect, 15–30 in., flowers salmon, leaves erect from separate shoots, no. 279; also in southern Tanganyika. *S. sacculatum* (Rendle) Rolfe; 6500 ft., erect to 3 ft., flowers red or orange, leaves sheath-like, no. 664; westwards to Ruanda, Virunga, Ruwenzori and Cameroons, and southwards to Nyasaland. *S. dizygoceras* Summerh.*; about 7000 ft., erect to 18 in., flowers green, leaves sheath-like, no. 595; also in Nigeria.

Polystachya.—*P. nigrescens* Rendle; 9000 ft., erect epiphyte to 12 in., flowers green, paniculate, no. 479; Ruwenzori and Nyasaland. *P. stricta* Rolfe; 6500 ft., epiphyte on wild Olive tree, flowers greenish-yellow, paniculate, no. 564; Kenya Colony and Uganda. *P. Adansoniae* Rchb. f.; 6000 ft., epiphyte, flowers yellowish-green, no. 625; Gold Coast, Cameroons, Angola. *P. Steudneri* Rchb. f., 6700 ft., erect epiphyte to 12 in., flowers yellow in short lateral racemes, no. 504; also in Abyssinia. *P. ruwenzoriensis* Rendle; 6600 ft., epiphyte, erect to 9 in., flowers racemose, green, no. 640; Ruwenzori. *P. spatella* Kraenzl.; 7000 ft., epiphyte, flowers yellowish-green, racemose, no. 274; Ruwenzori and Virunga Mts.

Lissochilus.—*L. pyrophilus* Rchb. f.; 6750 ft., erect to 7½ in., flowers buff with pink stripes, no leaves at flowering time, no. 540; western Kenya Colony, western Uganda and southern Sudan. *L. mediocris* Rendle; 6900 ft., erect to 2 ft., flowers mauve, appearing before the leaves, no. 572; Uganda, Imatong Mts. *L. arenarius* Lindl.; 6000–7000 ft., erect to 2½ ft., flowers pale to bright purple, with very young leaves, no. 596; widely distributed in the grasslands of Tropical Africa. *L. Elliotii* Rendle; 6000 ft., erect, 4–8 ft., large broad leaves and purple flowers, no. 441; Kenya and Aberdares westward to Ruwenzori. *L. porphyroglossus* Rchb. f.; 6000 ft., in swamp, erect to 9 ft., flowers purple, leaves broad, no. 662; Monbuttu, Niam-niam, Uganda, Zanzibar. *L. ruwenzoriensis* Rendle; 6500–6800 ft., erect to 18 in., flowers yellow, leaves about 1 in. wide, no. 635; Uganda westward to Ruwenzori and Virunga Mts. *L. Oliverianus* Rchb. f.; 7000–8000 ft., erect to 4 ft., flowers yellow, before the leaves, no. 87; S. Kenya Colony, Uganda, Bukoba, Virunga Mts. *L. bellus* (N. E. Br.) Schlect.; 6500–7500 ft., erect to 4 ft., flowers red and yellow, leaves obtuse, emarginate, nos. 11; 11a; 11b; Uganda, Kenya Colony and Zambeziland. *L. Wakefieldii* Rchb. f. et S. Moore; 6000 ft., in swamp, erect to 4 ft., flowers bright yellow, leaves acute, no. 585; Sudan, Uganda, Kenya Colony and Zambeziland.

Eulophia.—*E. montis-Elgonis* Summerh.*; erect to 2½ ft., flowers pinky-mauve, leaves very long and acute, no. 663. *E. milanjiana* Rendle; 6200 ft., erect to 2½ ft., flowers yellow with chocolate and bright yellow throat, no. 634; southern Sudan and Uganda southwards to Nyasaland and Portuguese East Africa.

Pteroglossaspis.—*P. ruwenzoriensis* (Rendle) Rolfe; 6700 ft., erect to 18 in., flowers maroon, no. 665; Kenya Colony westwards to Ruwenzori.

Diaphananthe.—*D.* sp.; 6700 ft., an epiphyte with short stem and spikes of medium sized whitish flowers, Tweedie 10; this is probably an undescribed species.

Chamaeangis.—*C. odoratissima* Schlect.; 6700 ft., an epiphyte with elongated leafy stem, flowers small, in whorls of 3–4 on a long slender spike, Tweedie 24; Cameroons, Congo, Uganda.

Aerangis.—*A. Thomsoni* (Rolfe) Schlect.; 8650 ft., epiphyte, about 5 slightly scented white flowers on each raceme, spur about 5 in. long, leaves broad, no. 468; Leikipia Plateau and the Uganda side of Mt. Elgon. *A. floribunda* (Rolfe) Summerh.*; 6600 ft., epiphyte with scented white flowers which become orange when old, leaves narrow, bilobed at the apex, no. 645; Uganda.

Cyrtorchis.—*C. Whytei* (Rolfe) Schlect.; 6600 ft., epiphyte, stem somewhat elongated, leaves bilobed at the apex, flowers faintly scented, large, white, with very acute reflexed segments, no. 565; the Uganda side of Mt. Elgon, and in Nyasaland.

Tridactyle.—*T. fimbriata* Schlect.; 6700 ft., an epiphyte with an elongated leafy stem, and lax spikes of small orange flowers, Tweedie 23; Uganda, W. Kenya, N. Tanganyika.

Araceae.

Arisaema.—*A. ruwenzoricum* N. E. Br.; 6800 ft., erect to 3 ft., leaves digitate, at same time as flowers, leaf-segments entire, spathe green with white stripes, no. 633; Aberdares, Kikuyu, Limuru, Ruwenzori.

Amorphophallus.—*A. Schweinfurthii* (Engl.) N. E. Br.; 6000–6500 ft., uncommon, erect to 15 in., flowers before the leaves, leaf segments pinnatipartite, spathe dark claret-coloured, with strong green veins on the back, no. 581; Kenya Colony, Uganda and Sudan westwards to the northern Cameroons, and also (*ex* Engler) in Tanganyika Territory.

Sauromatum.—*S. nubicum* Schott; 6700 ft., uncommon, stem 8 in., deep maroon, spathe 10 in., pale yellow with maroon markings, appearing before the pedatisect leaves, no. 580; Abyssinia and Eritrea southwards to Nyasaland.

Typhaceae.

Typha.—*T. australis* Schum. et Thonn.; 6400 ft., a bulrush, erect to 3 ft. above the water, flowers brown, no. 533; widely distributed in Tropical and South Africa.

Juncaceae.

Luzula.—*L. Johnstonii* Fr. Buch.; 13,000 ft., a rush up to 2 ft. high, no. 682; Kilimanjaro, Shira, Virunga Mts. and Ruwenzori.

Eriocaulonaceae.

Eriocaulon.—*E. Friesiorum* Bullock*; 10,200 ft., rosette herb with linear leaves, flowers black and white, capitate on peduncles up to about 1 ft. high, no. 683; Aberdares.

Cyperaceae. (E. Milne-Redhead).

Kyllinga.—*K.* sp.; 6500–7500 ft., dwarf erect rush 5 in. high, flowers brown, no. 120. This is probably *K. pinguis* C. B. Cl., but accurate identification is impossible in the absence of the rootstock.

Cyperus.—*C. eucentinigricans* K. Schum.; 8600 ft., erect plant up to 2 ft. high, spikelets rich brown, no. 463; East Africa. *C. dichroostachyus* Hochst. ex A. Rich.; 9000 ft., erect plant up to 2 ft. high, spikelets black and green, no. 467; eastern and southern Tropical Africa, Madagascar and Yunnan. *C. distans* Linn. f.;

6500–7500 ft., erect rush up to 2½ ft. high; spikelets brown and green, no. 184; tropics generally. *C. Fischerianus* Schimper ex A. Rich.; 6500 ft., on margin of forest, a plant with triangular stem with smooth dark surface, trailing over bushes, no. 620; East Africa.

Mariscus.—*M. longibracteatus* Cherm. var. *subdistans* Kukenth.; 6500–7500 ft., erect rush, 2 ft. high, spikelets green, no. 185; Kenya Colony and Uganda. *M.* sp., 6500–7500 ft., dwarf erect rush, 4 in. high; spikelets white, no. 121; this specimen is possibly *M. mollipes* C. B. Cl. but it is too poor to identify with certainty.

Scleria.—*S.* sp., 6700 ft., erect rush, up to 1·5 ft. high, no. 667; specimen too poor for identification.

Carex.—*C. Petitiana* A. Rich., about 9000 ft., erect sedge 3 ft. high; inflorescence brown, no. 482. Abyssinia and East African mountains. *C. simensis* Hochst. ex A. Rich.; 13,000 ft., erect rush up to 1½ ft. high, no. 680; Abyssinia, East African mountains and Cameroons Mt.

Gramineae. (C. E. Hubbard).

Arundinaria.—*A. alpina* K. Schum.; 8300–10,000 ft., erect bamboo to 35 ft., with hollow culms, no. 480; forming extensive forests on the mountains of Kenya Colony, Uganda, Tanganyika and eastern Belgian Congo.

Eragrostis.—*E. hispida* K. Schum.; 6700 ft., low densely tufted perennial with silvery-green hairy panicles, no. 666; Kenya Colony and Uganda southwards to Rhodesia. *E. Taffzagra* Steud.; 6700 ft. tufted perennial with large loose glabrous panicles of large ovate or oblong spikelets, no. 604; East Africa. *E. chalcantha* (Kunth) Trin.; 6700 ft., small tufted perennial with narrow panicles of small greyish or olive-green ovate spikelets, no. 607; East Africa southwards to the Cape, and in Arabia. *E. tenuifolia* Hochst.; 6700 ft., tufted perennial with a lax glabrous panicle of very narrow spikelets. no. 612; East Africa and the Sudan.

Agrostis.—*S. Schimperiana* Hochst.; 13,000 ft., perennial with contracted panicles of minute green or purple spikelets, no. 681; East Africa.

Sporobolus.—*A. Stapfianus* Gandoger; 6700 ft., slender tufted perennial with delicate lax panicles, no. 606; Tropical and South Africa. *S. filipes* Stapf MS.; 6600 ft., perennial with large, loose, lax panicles, no. 676; Kenya Colony and Uganda. *S. indicus* (Linn.) R. Br.; 6500 ft., densely tufted perennial with more or less contracted narrow panicles, no. 675; Tropical and South Africa, and in Tropical America. *S. capensis* (Willd.) Kunth; densely tufted perennial with narrow spike-like panicles, s.n. ; Kenya Colony and Uganda southwards to the Cape.

Cynodon.—*C. Dactylon* (Linn.) Pers. ; 6700 ft., creeping perennial with long runners and rhizomes and erect flowering culms bearing at the apex slender digitate spikes, no. 603 ; tropical and warm temperate regions.

Trichopteryx.—*T. simplex* (Nees) Hack. ; 6700 ft., densely tufted perennial with lax dark brown awned panicles, no. 668 ; Kenya Colony southwards to South Africa.

Echinochloa.—*E. stagnina* (Retz.) P. Beauv. ; 6500 ft., in and near water, perennial with long creeping fleshy rhizomes and secund inflorescences, no. 672 ; Tropical and South Africa, and in Tropical Asia.

Setaria.—*S. sphacelata* (Schum.) Stapf et C. E. Hubbard ; 6700 ft., tufted perennial with spike-like bristly inflorescences, the bristles mostly orange, no. 605 ; Tropical and South Africa.

Brachiaria.—*B. brizantha* (Hochst.) Stapf ; 6700 ft., tufted perennial with an inflorescence of secund spike-like racemes, the latter glabrous or fringed with white hairs, no. 611, Tropical and South Africa. *B. soluta* Stapf ; 6700 ft., loosely tufted perennial, racemes fringed with yellow hairs, no. 609 ; Kenya Colony, Uganda, Tanganyika and Belgian Congo.

Digitaria.—*D. scalarum* (Schweinf.) Chiov. ; perennial with long creeping rhizomes and linear leaf-blades, s.n. ; East Africa. *D. velutina* (Forsk.) Beauv. ; 6700 ft., tufted annual with linear to narrowly lanceolate leaf-blades, no. 610 ; Tropical and South Africa and in Arabia, Mascarene Islands, India and Tropical America.

Pennisetum.—*P. clandestinum* Hochst. ; 6700 ft., perennial with long creeping stolons and rhizomes, the inflorescence much reduced and for the most part enclosed in the uppermost leaf-sheath, a good grazing grass, no. 602 (" Kikuyu grass ") ; East Africa.

Rhynchelytrum.—*R. roseum* (Nees) Stapf et C. E. Hubbard ; 6700 ft., annual or perennial with pink, red or white panicles of densely hairy spikelets, no. 601 ; Tropical and South Africa.

Hyparrhenia.—*H.* sp. near *H. formosa* Stapf ; 6700 ft., perennial, to 5 ft., with large spatheate panicles, spathes reddish-brown, no. 613.

Themeda.—*T. triandra* Forsk., var. *punctata* (Hochst.) Stapf ; 6700 ft., densely caespitose perennial with erect culms and a spatheate panicle, the spatheoles hispid, with black tubercles, no. 608 ; East Africa.

XII—PRELIMINARY LIST OF DISEASES OF ECONOMIC PLANTS IN BRITISH GUIANA. E. B. MARTYN.

A number of records of diseases which have not been observed recently have been obtained from Departmental Reports, together with certain references occurring in Nowell's "Diseases of Crop Plants in the Lesser Antilles" (referred to as "Nowell"). In the cases of such records, the observer's name, or the source of reference, is given. Some of the minor diseases mentioned in early Reports, for which there is no subsequent verification, have been omitted.

Several crops which occupied a more important position in years gone by are now but little grown, or have gone entirely out of cultivation. Cocoa and lime are now only to be found in a few areas, and cotton, rubber and sisal are represented only by isolated plants, to be met with on the sites of former plantations.

Balata (*Mimusops globosa* Gaertn.).
  Die Back. Cause uncertain. (Agr. Journ. B.G. iii. 4, 231: 1930.)
Banana (*Musa sapientum* L.).
  Anthracnose. *Gloeosporium Musarum* Cooke et Mass.
  Wilt Disease. *Bacterium* spp. with sometimes *Fusarium cubense* E. F. Smith associated.
Bengal Bean (*Mucuna aterrima* Holl.).
  Leaf Spot. *Cercospora stizolobii* Syd.
Bean, Soya (*Glycine max* Merrill).
  Pod Blight. *Phomopsis* sp. (P. sojae Lehm. ? cf. R. A. M. ii. 151 : 1923.)
Cacao (*Theobroma Cacao* L.).
  Black Pod and Canker. *Phytophthora palmivora* Butl. (Recorded formerly as *P. Faberi* Maubl.)
  Die back. *Botryodiplodia Theobromae* Pat.; secondary.
  Excresences. Crowded with flowers, few of which open. Described by Bartlett, 1905; apparently akin to "Male Cocoa."
  Pink Disease. *Corticium salmonicolor* B. et Br. (Bancroft, 1915.)
  Thread Blight. *Corticium Koleroga* (Cooke) v. Höhn.
  Witch Broom. *Marasmius perniciosus* Stahel.
Coconut (*Cocos nucifera* L.).
  Leaf Spots. *Diplodia epicocos* Cooke; secondary.
    Pestalozzia Palmarum Cooke; secondary.
  Red Ring. *Aphelenchus cocophilus* Cobb. (Stell, 1920.)
  Wilt. Formerly known as "bud rot"; due to environmental conditions.
Coffee (*Coffea* spp.).
  American Leaf Disease. *Omphalia flavida* (Cooke) Maubl. et Rang. (Bancroft, 1915.)

Brown Eye Spot. *Cercospora coffeicola* Berk. et Cooke.
Phloem necrosis. *Phytomonas* sp.
Sclerotium Disease. *Sclerotium coffeicolum* Stahel.
Wilt. *Papulospora* sp. (Alston, 1925 and 1926.)

Cotton (*Gossypium* spp.).
Anthracnose. *Glomerella Gossypii* Edgert. (Recorded as *Colletotrichum Gossypii* Southw., by Bancroft, 1915).
Cotton Rust. *Kuehneola Desmium* (B. et Br.) Butl. (Recorded as *Uredo Gossypii* Lagerh., in Nowell, 283.)
Internal Boll Disease. (Described by Bartlett, 1907 ; Nowell, 263.)

Fig (*Ficus Carica* L.).
Leaf Blight. *Cercospora Bolleana* (Thüm.) Speg. (Jenman, 1901 ; first specific mention of a plant disease in Department's Records).

Grape (*Vitis vinifera* L.).
Black rot. *Guignardia Bidwellii* (Ell.) Viala et Rav. (Recorded as Anthracnose by Bancroft, 1915.)
Powdery Mildew. *Uncinula necator* (Schw.) Burr. (Recorded as *U. spiralis* B. et C. by Bancroft, 1915.)

Ground Nut (*Arachis hypogaea* L.).
Leaf Rust. *Puccinia Arachidis* Speg.
Leaf Spot. *Cercospora personata* (B. & C.) Ell. et Ev.

Lime (*Citrus aurantifolia* Swingle).
Citrus knot. *Sphaeropsis tumefaciens* Hedges. (Bancroft, 1915.)
Mal-di-Gomma. *Phytophthora parasitica* Dastur. (Nowell, 213.)
Red Root Disease. *Sphaerostilbe* sp. (Nowell, 203).
Sooty Mould. *Capnodium Citri* Berk. et Desm.
Wither Tip. *Gloeosporium limetticolum* Claus.

Maize (*Zea Mays* L.).
Smut. *Ustilago Maydis* (DC.) Corda.

Mango (*Mangifera indica* L.).
Anthracnose. *Gloeosporium Mangiferae* P. Henn.
Black Blight. *Capnodium mangiferum* Cooke et Broome.

Onion (*Allium Cepa* L.).
Downy Mildew. *Phytophthora* sp.

Orange (*Citrus sinensis* Osb.).
Damping off of seedlings. *Fusarium* sp.
Ripe Rot. *Penicillium digitatum* (Fr.) Sacc. (Recorded as *P. olivaceum* Wehmer, Bancroft, 1915.)

Papaw (*Carica Papaya* L.).
Black Leaf Spot. *Asperisporium Caricae* (Speg.) Maubl. (Recorded as *Pucciniopsis Caricae* Earle, Bancroft, 1915.)

Peppers (*Capsicum* sps.).
Anthracnose. *Colletotrichum nigrum* Ell. et Halst.

Pineapple (*Ananas comosus* Merrill).

"Black Eye." (Nowell, 349.) Cause uncertain.

Fruit Rot. *Ceratostomella paradoxa* Dade. (Recorded as *Thielaviopsis paradoxa* (de Seynes) v. Höhn).

Plantain (*Musa paradisiaca* L.).

Wilt Disease. *Bacterium* spp. with sometimes *Fusarium cubense* E. F. Smith associated.

Potato (*Solanum tuberosum* L.).

Root Knot. *Heterodera radicicola* (Greef.) Muller.

Rice (*Oryza sativa* L.).

Blast. *Piricularia Oryzae* Bri. et Cav.

"Man Rice." *Fusarium* ? *moniliforme* Sheld.

Sclerotial Disease. *Sclerotium Oryzae* Catt. (Bancroft, 1915.)

Smut. *Tilletia horrida* Tak. (Bancroft, 1915.)

Rose (*Rosa* spp).

Black Spot. *Diplocarpon Rosae* Wolf.

Crown Gall. *Bacterium tumefaciens* E. F. Sm. et Towns. (Bancroft, 1915.)

Mildew. *Sphaerotheca pannosa* (Wall.) Lév.

Rubber, Para (*Hevea brasiliensis* Muell. Arg.).

Die back. *Botryodiplodia Theobromae* Pat. (Bancroft, 1915.)

Root Disease. *Fomes lignosus* (Kl.) Bres. (Recorded as *F. semitostus* Berk. by Bancroft, 1915.)

South American Leaf Disease. *Melanopsammopsis Ulei* (P. Henn.) G. Stahel. (Also recorded as *Passalora Heveae* Mass.).

Sisal (*Agave rigida* Mill. var. *sisalana*).

Anthracnose. (*Colletotrichum Agaves* Cav.)

Sudan Grass (*Sorghum sudanense* Hitch.)

Leaf Spot. *Colletotrichum falcatum* Went.

Sugar Cane (*Saccharum officinarum* L.)

Chlorosis, non-infectious. Several types, due to environmental conditions. (Department's Reports, 1929–1930.)

Diplodia Rot. *Botryodiplodia Theobromae* Pat. (A. Howard; Nowell, 308.)

Pineapple Disease. *Ceratostomella paradoxa* Dade (Recorded as *Thielaviopsis paradoxa* (de Seynes) v. Höhn.)

Red Rot. *Colletotrichum falcatum* Went. (Bancroft, 1915.)

Red Spot of Leaf Sheath. *Cercospora vaginae* Krüg.

Rind Disease. *Melanconium Sacchari* Mass.; secondary.

Ring Spot. *Leptosphaeria Sacchari* v. Breda.

Root Rot. Formerly attributed to *Marasmius sacchari* Wakker and other fungi, now considered primarily due to environmental conditions.

Top Rot. *Bacterium* spp. associated. Probably a secondary disease. (Alston, Department's Reports, 1923–26.)

Twisted Top. Apparently mechanical, and non-infectious.

Sun Hemp (*Crotalaria juncea* L.).

Wilt. *Fusarium vasinfectum* Atk.

Sweet Potato (*Ipomoea Batatas* Lam).

White Rust. *Cystopus Ipomoeae-panduranae* (Schw.) Stev. et Swingle.

Tobacco (*Nicotiana Tabacum* L.)

Mosaic. Virus disease.

Tomato (*Lycopersicum esculentum* Mill.)

Blossom End Rot. Due to environmental conditions affecting water supply.

Leaf Mould Disease. *Cladosporium fulvum* Cooke.

Root Knot. *Heterodera radicicola* (Greef.) Muller.

Wilt. *Bacterium solanacearum* E. F. Smith.

Wilt. *Fusarium Lycopersici* Sacc.

XIII—MISCELLANEOUS NOTES.

SIR DANIEL MORRIS.—It is with great regret that we record the death, on February 9th, in his eighty-ninth year, of Sir Daniel Morris, K.C.M.G., Assistant-Director of the Royal Botanic Gardens, Kew, from 1886 to 1898.

Sir Daniel was educated at Cheltenham College, the Royal College of Science, South Kensington, and at Trinity College, Dublin, where he graduated with first-class honours in 1876. The following year he was appointed Assistant to Dr. Thwaites at Peradeniya, where he remained for two years, working especially at *Hemileia vastatrix*, which was at that time threatening the coffee plantations of Ceylon. In 1879 he was appointed Director of the Public Gardens and Plantations in Jamaica, a post which enabled him to commence his life-long study of tropical economic botany, especially fruit and fibre plants, and which gave him a knowledge of West Indian conditions invaluable during his later work in that region.

During his Directorship in Jamaica, which he held for seven years, Dr. Morris, as he was then, visited British Honduras and St. Helena, publishing two valuable reports on the resources and prospects of these colonies.

In 1886 Sir Joseph Hooker retired from the Directorship of Kew, Sir William Thiselton-Dyer succeeded him and Dr. Morris was appointed Assistant-Director. During his period of office, besides writing many articles in the Kew Bulletin on various economic products, especially fibre plants (see *K.B.* 1886–1898, *passim*), he published books on " Fruit as a Factor in Colonial Commerce " (1887), which greatly stimulated interest in colonial fruits, on " The Colony of the Leeward Islands " (1891), " The Sisal Industry of the Bahamas " (1896) and on other subjects. In 1890–91 he undertook a special mission to the West Indies in order to stimulate the development of the fibre, sugar, banana and other industries ; in 1895 he visited the Bahamas and in 1896 was appointed Expert Adviser on Agricultural and Botanical Questions to the West Indian Royal Commission. Following his work on this commission, which has been described as providing "the salvation of our West Indian possessions," Dr. Morris was appointed in 1898 to the important post of Imperial Commissioner of Agriculture in the West Indian Agricultural Department.

During his Assistant-Directorship at Kew, his knowledge of overseas conditions and problems had been of the greatest service in the work being done at that time for colonial agriculture under the enlightened policy of Mr. Joseph Chamberlain at the Colonial Office.

In the "Kew Bulletin" for 1898, p. 234, there is reprinted from "The Times" an extract from Mr. Joseph Chamberlain's speech outlining the aims and scope of the new post of Imperial Commissioner and expressing his conviction that "there was no one more capable of fulfilling these aims than Dr. Morris." These aims were, briefly, to found a special public department dealing with questions of economic botany, to set up botanic stations in all the islands, and to establish fortnightly communications between them. For ten years Dr. Morris worked on these lines, paying especial attention to the improvement of sugarcane by breeding and to the introduction and cultivation of a variety of other crops, notably sea-island cotton, thus reviving an industry which had lapsed for 100 years, cocoa and limes. Other important activities which he initiated were the training of a staff of experts to advise on agricultural matters throughout the West Indies, and the establishment of intercolonial agricultural conferences which have resulted in such valuable interchange of ideas between agricultural departments.

Sir Daniel retired in 1908, having been made C.M.G. in 1893, and K.C.M.G. in 1903, but he continued to lead a busy life, acting as Scientific Adviser to the Colonial Office until 1913, and serving on the governing bodies of the Imperial Institutes of Mycology and Entomology, and the John Innes Horticultural Institution. In Bournemouth, where he settled on his retirement, he took a leading part in the life of the town, and, as President of the Bournemouth Natural Science Society, did much to encourage the study of natural history in the neighbourhood. In 1919, when the British Association met in the town, he was President of Section K.

Sir Daniel, through his work both at Kew and in the West Indies, will always be remembered as an able and indefatigable worker for the improvement of the agricultural resources of the Empire.

Botanical Magazine.—The first part of vol. clvi, published on January 2nd, 1933, contains the description of a new genus *Leptaloë* by Dr. Stapf, the type plant of which has been known as *Aloë myriacantha* Schön., and *Aloe myriacantha* var. *minor* Berger in particular. This interesting new genus, represented in t.9300, contains some seven species and the one figured, *Leptaloë albida* Stapf, comes from the Saddleback Mountain, near Barberton in the Transvaal.

Other plants figured are *Haemanthus Nelsonii* Baker (t.9293), from the high veld of the Transvaal and Orange Free State; *Aichryson dichotomum* Webb et Berth. (t.9294), an annual or biennial '*Sempervivum*' common in the Canary Islands; *Parasyringa sempervirens* W. W. Smith (t.9295), a monotypic genus confined to N. W. Yunnan and adjacent parts of Szechuan, China; *Nomocharis saluenensis* Balf. f. (t.9296), a native of the N. W. corner of Yunnan and adjoining parts of Burma and Tibet; *Daphne sureil* W. W. Smith et Cave (t.9297), a white-flowered, tender shrub, from the Sikkim Himalaya and Southern Assam; *Berberis Jamesiana* Forrest et W. W. Smith (t.9298), from N. W. Yunnan, S. Szechuan and Tibet; *Bulbophyllum patens* King ex Hook. f. (t.9299) from Malaya; *Leptaloë albida* Stapf (t.9300), already mentioned; *Rhododendron sperabile* Balf. f. et Farrer (t.9301), discovered by Farrer in 1919 in N.E. Burma; *Astragalus utahensis* Torrey et Gray (t.9302), a charming plant native of the Rocky Mountains N. America, and *Fritillaria karadaghensis* Turrill (t.9303), from the northern part of Azerbeidjan, Persia.

The Romance of Empire Drugs.*—An interesting booklet bearing this title has recently been issued by the Scientific Department of Messrs. Stafford Allen & Sons, Ltd. Although no doubt issued primarily as a means of advertising the products of the firm, the publication contains a great deal of useful information on drugs and drug-plants. As the title implies, only drugs of Empire origin are dealt with, and the main sources are clearly indicated on an outline map of the world occupying the two cover pages. Two to three pages are devoted to each of the fifty-one drugs dealt with, forty-seven of which are of vegetable origin. One of the outstanding features of the publication, and one likely to appeal particularly to the popular reader, is the number of good photographs that are included. These show the plants either growing, or in the dried state, or in some stage during the collection of the drug. The descriptive matter is presented in an attractive and readable form and bears evidence of care in its compilation, although in a few instances the botanical terminology is open to question. Special attention has been paid to early history and uses, and the information supplied under this category should prove of special interest.

The low price at which the booklet is published should favour a wide circulation, and its appearance at the present time is appropriate in view of the increasing interest taken in Empire products.

F. N. H.

---

* "The Romance of Empire Drugs," issued by the Scientific Department of Messrs. Stafford Allen & Sons, Ltd., Cowper Street, London, E.C. Pp. 135, ill. 64. Price 1*s*. or 9*s*. per doz.

Printed under the authority of HIS MAJESTY'S STATIONERY OFFICE,
By the South Essex Recorders, Ltd., High Road, Ilford.
(19) Wt. 71/28 925 3/33 S.E.R. Ltd. Gp. 9.

BULLETIN OF MISCELLANEOUS
INFORMATION No. 3 1933
ROYAL BOTANIC GARDENS, KEW

XIV—SOME INDIAN RHODOPHYCEAE ESPECIALLY FROM THE SHORES OF THE PRESIDENCY OF BOMBAY. III.* F. BOERGESEN.

BANGIACEAE.

Goniotrichum elegans (*Chauv.*) *Le Jolis*, Alg. mar. Cherbourg, 103; Berthold, Bangiaceen, 26; Rosenvinge, Mar. Alg. Denm. 75. —*Bangia elegans* Chauvin, Mem. Soc. Linn. Norm. t. 6 (1838), not seen.

A common epiphyte upon various algae. The thallus near the base is 27μ thick, at the summit of the branches 12–15μ.

INDIA: Dwarka, Tuticorin.

Distr. Seems to occur in most temperate and warm seas.

CHANTRANSIACEAE.

Acrochaetium Iyengarii *Boergs.* sp. nov.; *A. caespitiformi* Boergs. proximum, quod tamen a specie nostra nova praeter alia filamentis tenuioribus et magis ramosis, sporangiis in ramulis positis, pilorum absentia differt.

Thallus caespitosus, usque ad 1 mm. altus e disco basali, in filamentis hospitis epiphyticus et e filis erectis ramosis compositus. *Discus basalis* valde expansus, unistratosus, e filis repentibus horizontalibus confluentibus, cellulis brevibus, 6–7μ longis, 5–6μ latis, constructus. *Fila* erecta, in parte basali simplicia, in superiori parte plus minus sparsa aut unilateraliter ramosa, ramis brevibus, simplicibus aut paucis ramulis instructis. *Pili* hyalini, breves, terminales, 60μ longi et 2·5μ lati adsunt. *Cellulae* in filis erectis plus minus moniliformes, circiter 6μ latae et 15μ longae, chromatophorum parietale, pyrenoide laterali instructum continentes. *Sporangia* oblongo-ovalia, 8μ lata et 13μ longa, sessilia aut pedicellata, in latere ramorum secundatim disposita, rarius plus minus sparsa aut opposita.

INDIA: Mahabalipuram (The Seven Pagodas) South of Madras, *Prof. Parthasarathy Iyengar* legit et dedit.

This grows in large tufts (Fig. 1) on *Chaetomorpha media*. The basal disc (Fig. 2a) is composed of the congenitally united horizontal filaments which are easily visible also in the older discs. The disc is about 6μ thick and the cells a little longer than broad. From the cells in the disc the erect filaments arise forming dense tufts up to

---

*Continued from *K.B.* 1932, 134.

about 1000μ (Fig. 1). The erect filaments are composed of cells somewhat moniliform, and as a rule they have no branches in the lower part (Fig. 1); in the upper part a few short branches, unilateral or scattered are often present. Many of the tips of the filaments end in short thin hairs (Fig. 1, 2c). The monosporangia (Fig. 2d, e) are ovate-elliptical, 13μ long and 8μ broad and most often sessile. Sometimes a few are found seriately together, sometimes more irregularly and rarely opposite.

The host-plant was growing in a very exposed place on rocks near the shore.

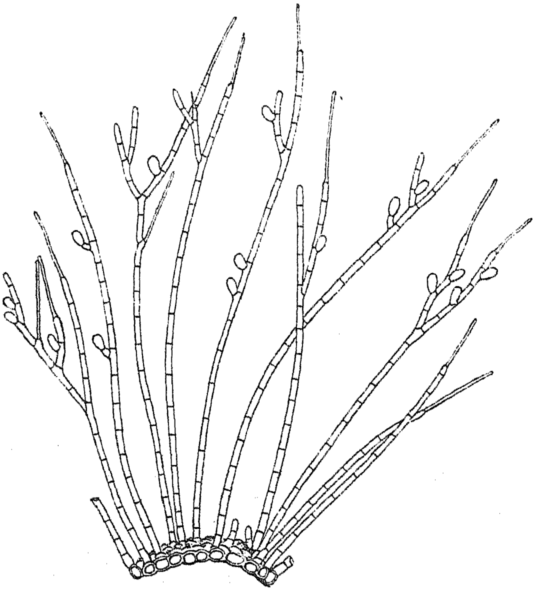


Fig. 1. *Acrochaetium Iyengarii* Boergs. (× 248).

BONNEMASONIACEAE.

Asparagopsis Sandfordiana *Harv.* in Trans. Ir. Acad. xxii. 544; Phycologia Austral. i. t. vi.

It is especially on account of its size, dark colour and geographical distribution that this species has been separated from *A. taxiformis* (Del.) Coll. et Herv. But, as pointed out by various investigators, both forms are closely related. A few almost ripe cystocarps were found. The plant was dredged at a depth of about 5–10 fathoms. Cystocarps were present in January.

INDIA: Dwarka; Karachi, *A. B. Kotwal* (Herb. New York Bot. Garden).

Distr. Tonga Islands, Australia, etc.

GELIDIACEAE.

Gelidium pusillum (*Stackh.*) *Le Jol.* List. Alg. Cherb. 139; Kütz. Tab. Phycol. xviii. 37.

The few specimens found formed dense low tufts upon exposed rocks in the littoral zone. The specimens were about 1–1½ cm. high and agreed with the description of var. *conchicola* Picc. et Grun. in Nuov. Giorn. Bot. Ital. xvi. 316 (1884).

INDIA : Bombay : Malabar Hill.

Distr. West Coast of Europe, Mediterranean Sea, Red Sea, Malayan Archipelago, Japan, etc.

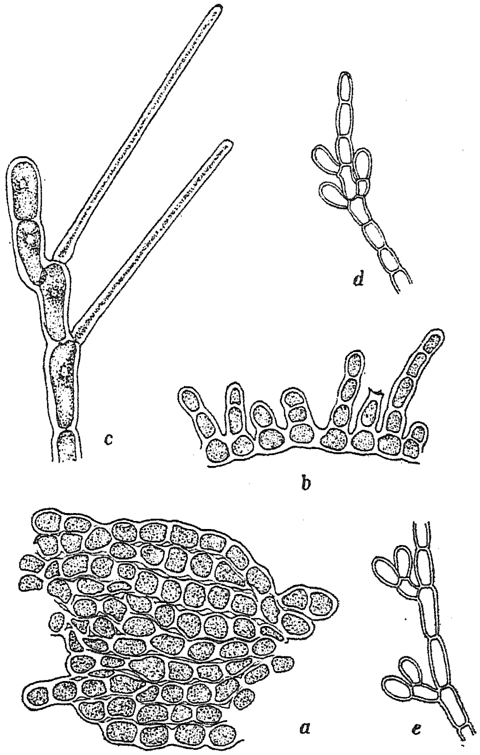


Fig. 2. *Acrochaetium Iyengarii* Boergs.: a, part of the basal disc; b, transverse section of disc with young erect filaments; c, upper end of filament with hairs; d, e, parts of filaments with sporangia (a, b, × 353; c, × 525; d, e, × 375).

Caulacanthus ustulatus (*Mert.*) *Kütz.* Phycol. Gener. 395 ; Spec. Alg. 753 ; Tab. Phycol. xviii. 8 ; J. Agardh, Spec. Alg. ii. 433 ; Bornet et Thuret, Not. algol. 55, t. 19.—*Fucus ustulatus* Mert. fide Kützing.

The Indian plant seems to agree well with *C. ustulatus*. I have compared it with specimens from various localities in the Atlantic Ocean and found that they agree well as to size and ramification of the thallus and size of peripheral cells, etc. The thallus of the Indian plant is 150–250µ thick and like the European plant has short attachment discs composed of coherent peripheral cells growing out in all directions. The summits of the filaments are acute. According to the description (Liste des Algues du Siboga, 222) *Caulacanthus indicus* Web. v. B. is a much smaller plant with compressed fertile branches. In connection with Mme. Weber's remark that it differs from *Caulacanthus ustulatus* in its great number of discs, I may mention that I have found numerous discs in my Indian specimens and also in European and Canarian material.*

Tetraspores were found only in my material gathered in January. The plant is common on rocks in the littoral zone near Bombay, where it grows in exposed as well as in more sheltered places.

INDIA: Bombay: Malabar Hills in various places; Back Bay; Colaba.

Distr. Atlantic Ocean, Mediterranean Sea, Cape, Malayan Archipelago.

Echinocaulon acerosum (Forssk.) Boergs. in Dansk Bot. Arkiv, viii. no. 2, 5 (1932).—*Fucus acerosus* Forssk. Fl. Egypt.-Arabica, 190. *Gelidiopsis rigida* (Vahl) Web. v. Bosse in Rec. Trav. bot. Néerl. i. 104; Boergesen, Mar. Alg. D.W.I. ii. 370, fig. 362.—*Fucus rigidus* Vahl in Skrivter af Naturh.-Selsk. v. 46 (1802). *Echinocaulon rigidum* Kütz. Tab. Phycol. xviii. t. 40; J. Feldmann, Remarques sur les genres *Gelidium* Lamour., *Gelidiopsis* Schmitz et *Echinocaulon* (Kütz.) emend. in Rec. de Trav. Crypt. dédiés à Louis Mangin (1931).

Gathered once only, and sterile. It agreed very well with my figures (l.c.); the young parts of the thallus were densely covered with hairs, as in my figure 362a. Found in a rock pool near low water mark in an exposed locality.

INDIA: Dwarka.

Distr. Seems to occur in all warm seas.

RHIZOPHYLLIDACEAE.

Catenella repens (*Lightf.*) *Batters*, A Catalogue of British Mar. Algae, 69 (1902).—*Fucus repens* Lightf. Fl. Scot. ii. 961 (1777). *Catenella Opuntia* (Good. et Woodw.) Grev. Alg. Brit. 166 (1830). *Fucus Opuntia* Good. et Woodw. in Linn. Soc. Trans. iii. 219 (1797).

Together with several other small creeping algae this plant forms dense low tufts upon the rocks in the littoral zone.† It grows in exposed localities and as the water is rather polluted much sand and mud is found between the algal vegetation. The specimens, gathered in January, are tetrasporic.

INDIA: Bombay, Malabar Hill facing the Arabian Sea.

Distr. All warmer seas.

---

*Compare Boergesen, Marine Algae from the Canary Islands, iii. Rhodophyceae, 1, 80 (1927).

†In contrast to the West Indian form (var. *pinnata*) in which the branches issue from the sides of the joints, these structures are given out from the narrowings between the joints. Furthermore the haptera in the Indian plant are often terminal upon long, almost cylindrical or clavate joints.

Chondrococcus Hornemanni (*Mert.*) *Schmitz* in Engl. Bot. Jahrb. xxi. 170 (1895); E. S. Barton, in Journ. Bot. 1896, 460.—*Fucus Hornemanni* Mert. in Göttinger Gel. Anzeiger, no. 64 (1815). *Desmia Hornemanni* Lyngb. Hydrophytolog. Danic. 35, t. 7 C (1819). For more literature see De Toni, Syll. iv. 1674.

I have been able to compare the Indian specimens with the original specimen determined by Mertens, originating from Herb. Hornemann and now to be found in the Botanical Museum, Copenhagen. This specimen was most probably collected by Forsskål in the Red Sea, but by a mistake (perhaps by confusion of labels) it is said to have been found at Elsinore in Öresund. On account of this Lyngbye figures this species in Hydrophyt. Dan. Schmitz, and later Rosenvinge (in Mar. Algae of Denmark, pt. 4, Rhodophyceae, iv. 617: 1931), have pointed out that this species certainly does not belong to the Danish flora. Whilst I quite agree with these two authors as to this, I cannot agree with them, when they consider *Chondrococcus Lambertii* (Suhr) as a species distinct from *C. Hornemanni.* I concur with Mrs. Ethel S. Gepp (Barton), when she (l.c.) points out very emphatically that these two " species " are one and the same plant. Mrs. Gepp writes: " In the British Museum there are forms of this plant ranging from the very narrow thallus corresponding with Lyngbye's plate of *D. Hornemanni* through all grades up to a large form of *S. Lambertii*. A careful examination of these plants leads to the inevitable conclusion that no form is worthy even of being ranked as a variety, for no one could tell where the typical plant ends and the variety begins." The same is the case with a series of specimens in the Kew Herbarium. These show an even transition from a plant with a thallus about ½ cm. broad to forms with a thallus narrower even than that pictured in " Hydrophytologia." The specimens which I have seen were sterile.

INDIA: Karachi, Island of Hallani *W. J. S. Pullen* (Herb. Kew.). Pamban, *M. O. P. Iyengar* (Herb. Brit. Mus.). It has earlier been found in India by *Wight.*

Distr. Seems to be widely spread in the Indian Ocean.

GIGARTINACEAE.

Ahnfeltia plicata (*Huds.*) *Fr.* Fl. Scand. 310; J. Agardh, Spec. Alg. ii. 311.—*Fucus plicatus* Huds. Fl. Angl. 470.

There are several sterile specimens in the Kew Herbarium. The breadth of the thallus is 0·5 mm.

INDIA: Karachi, June 1883, *J. A. Murray.*

Distr. North Atlantic Ocean, Brazil, California, Kerguelen Land.

CHAMPIACEAE.

Champia compressa *Harv.* var. **scindica,** var. nov. (*Champia scindica Harv.* nomen nudum in Herb. Kew.); a var. *typica* praecipue differt thallo majore et robustiore, plus minus opposite ramoso, ramificatione multo profusiore et densiore.

Of this variety I have had fine fruiting material preserved in spirit and presented to me by Mr. K. G. Naik, Sind College, Karachi. The specimens (Fig. 3) form dense, much ramified bushes about 10 cm. high. The branches are more or less opposite in the lower part and more irregularly arranged in the upper. They issue from the edges of the compressed thallus which reaches a breadth of about 3 mm.; the joints are short. From Harvey's figure in Nereis Australis, t. 30, and from a specimen of his Ceylon Algae, no. 16, preserved in the Botanical Museum, Copenhagen, the Indian plant differs by its greater size, its much denser ramification, and its fewer opposite branches. Transverse sections (Fig. 4b) of the compressed thallus show that its wall consists of a layer of oblong, often rather narrow and densely placed cells, and, near the peripheral ends of these, small scattered cortical cells. The vertical filaments run along the inner side of the cells in the wall, but several are also found in the cavity. The tetrasporangia are scattered in great numbers in the wall. The cystocarps (Fig. 4a) are urn-shaped, up to 900μ broad and a little longer. They are scattered and up to 5–7 may be found upon the same joint (Fig. 3).

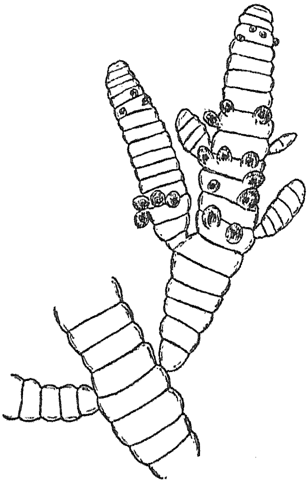


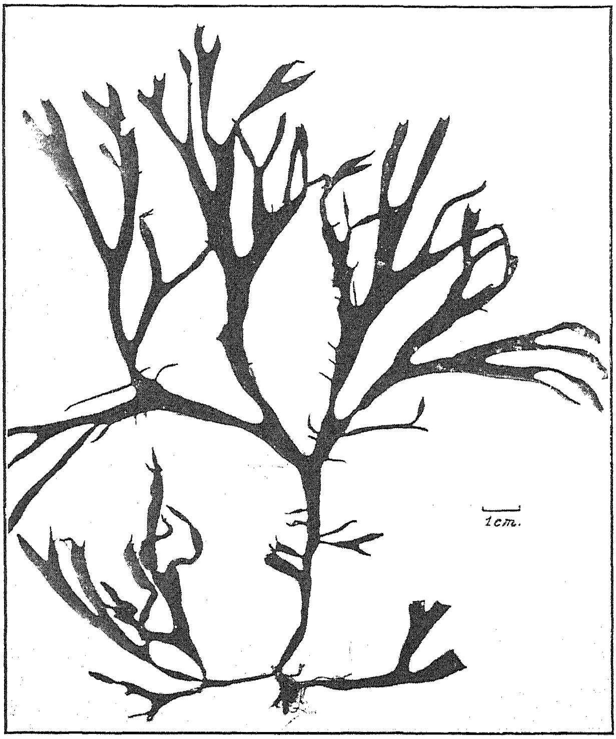
Fig. 3. *Champia compressa* Harv. var. *scindica* (Harv.) Boergs.: part of a female plant (× 4·5).

In the Kew Herbarium several specimens named *Champia scindica* are present; a photo of a fruiting specimen of one of these is seen in Plate V. Two other fruiting female specimens are labelled *Lomentaria Opuntia* J. Ag., but they are both most certainly referable to *C. compressa* var. *scindica*.

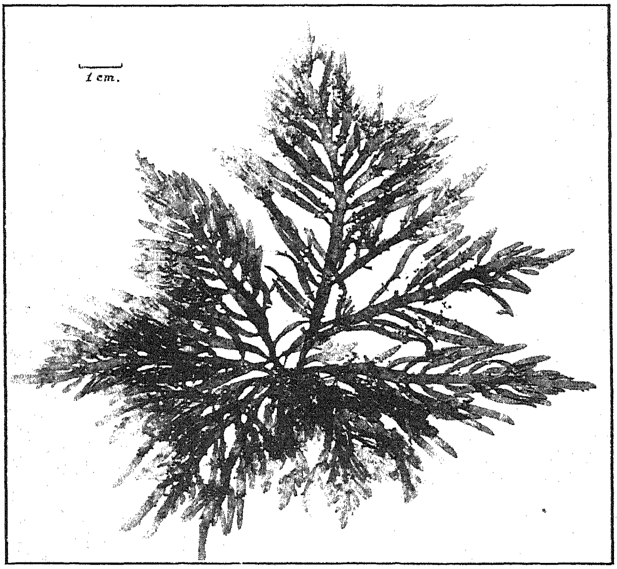
INDIA: Karachi, December 1859, *W. J. S. Pullen* (type in Kew Herb.); 1881–2, *J. A. Murray*; 1927, Manora Islands & Cape Monze, *K. G. Naik*; *A. B. Kotwal* (Herb. New York Bot. Garden).

Distr. (var. *typica*) Cape, Ceylon, Indian Ocean.

PLATE V



Sarcodia dichotoma Boergs.



Champia compressa Harv. var. *scindica* (Harv.) Boergs.

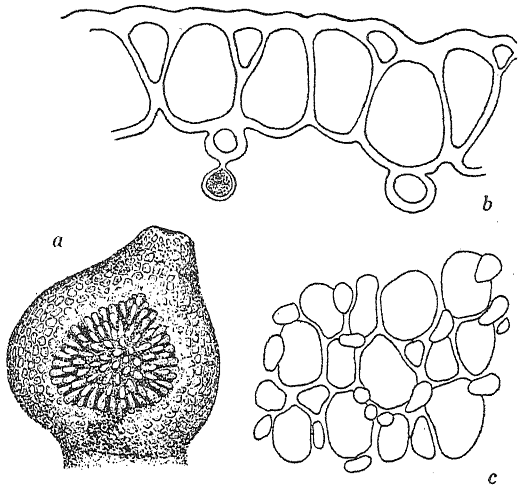


Fig. 4. *Champia compressa* Harv. var. *scindica* (Harv.) Boergs.: a, cystocarp; b, transverse section of the cells in the wall and longitudinal filaments, one of these with a gland cell; c, part of the thallus seen from above showing the cells in the wall and above these the scattered small cortical cells (a, × 34; b, c, × 248).

Champia somalensis *Hauck* in Hedwigia, 1888, 88; Notarisia, iii. 520.—*Champia compressa* f. *somalensis* (Hauck) De Toni in Mem. d. Pontificia Acad. dei Nuovi Lincei, xvii. 15 (not seen).

The thallus forms pyramidal tufts fastened to the substratum by rhizoids. As described by Hauck the wall in this plant consists of a cortical layer of small, densely placed, coloured cells and next to these 3–4 layers of bigger cells, the largest innermost (Fig. 6). Along the walls of these the vertical filaments are to be found, and in addition, several filaments run freely in the cavities of the joints. Like those running along the wall, these filaments pass through the diaphragms and are composed of long, cylindrical cells about 20μ broad and 450μ long. As usual in *Champia*, the vertical filaments bear the gland cells.

In dried material the thallus seems very slightly or not at all constricted, which agrees with the description given by Hauck, whereas in material preserved in spirit the articulation is strongly marked (comp. fig. 5). The joints are about $\frac{1}{2}$–$\frac{1}{3}$ as long as broad. The thallus is subterete and the branches are as a rule placed in two rows on both sides of it; they are irregularly alternate or opposite. The cystocarps (Fig. 5) occur scattered over the thallus; they are urn-shaped, about 800–900μ long, and about that width near their base.

At first the tetrasporangia are formed near the base of the ramuli, but gradually they are developed over the whole thallus. When dried the older parts of the thallus have a dark brown-red colour, whereas the young parts are rosy-red. By reason of the thick cuticula and wall (Fig. 6) the plant is rather tough and cartilaginous. Specimens with tetraspores and cystocarps are found in January.

I should add that I have not seen the type specimens of Hauck's plant, but my specimens agree very well with Hauck's description. De Toni referred to it as a form of *Champia compressa*. As regards its external habit and general appearance *C. somalensis* is very similar to *C. compressa* var. *scindica*, but it differs in colour and in its thick walls.

INDIA. Dwarka.

Distr. Shores of Somali.

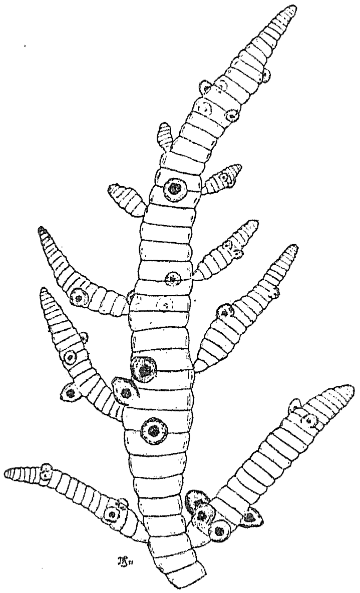


Fig. 5. *Champia somalensis* Hauck: part of a female plant (× 3).

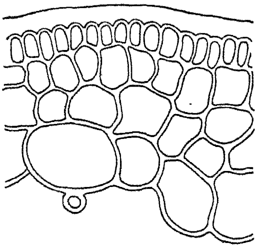
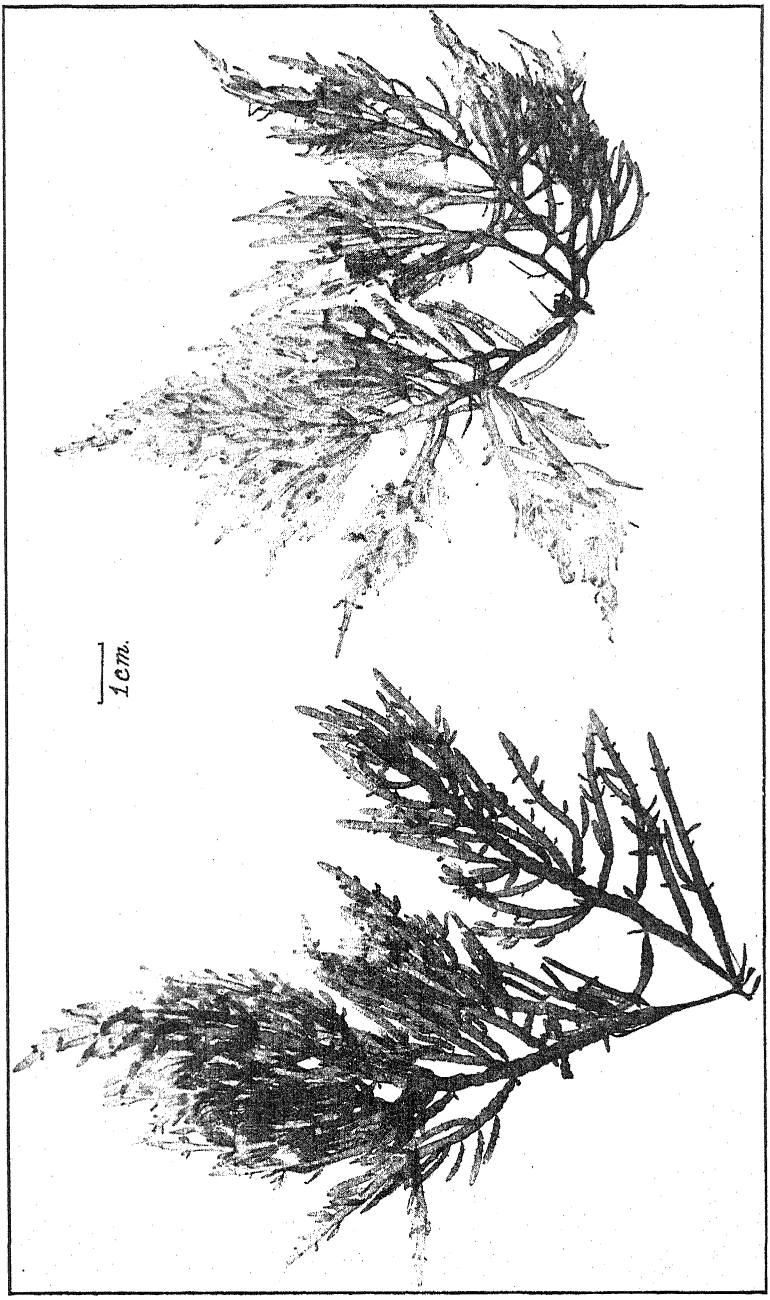


Fig. 6. *Champia somalensis* Hauck: transverse section of thallus and of a single longitudinal filament (× 195).

Champia indica *Boergs.* sp. nov.; *Champiae affini* (Hook. et Harv.) J. Ag. proxima, habitu et colore thalli persimilis, sed species nostra thallo minori, cystocarpiis depressis subsphaericis et ramulis superioribus non incurvatis praecipue differt.

The Indian plant (Plate VI) appears to be related to the Tasmanian with the exception of the differences mentioned above. In Herb. J. Agardh, at Lund, I have been able to compare my plant with the many specimens found there. Some of these differ in habit from my specimens in the presence of numerous tendrils or by peculiar ramification (see Kylin's figure in Lunds Universitets Årsskrift. N.F. Avd. 2, xxvii. no. 11, t. 15, fig. 35). Others, however, agreed with my specimens (*e.g.* no. 26,049 in Agardh's Herbarium). I consider the cystocarps sufficiently different in shape to mark it as a distinct

PLATE VI



Champia indica Boergs. A female (left) and a tetrasporic plant (right).

species. The geographical distribution is not so important, as several of the Australian species have been found in the northern part of the Arabian Sea.

The specimens reach a height of about 15 cm. and form dense pyramidal tufts; the dried specimens are rosy red. The plant is markedly articulated with barrel-shaped joints (Fig. 7), in the main branches about 3 mm. broad and about as long, in the branchlets only half as long. The wall is composed of one layer only of roundish-polygonal cells about 50–75μ long and 50–60μ broad. Similar small cortical cells to those described by me in *Champia salicornoides* Harv.* were also present here; their diameter is only about 12μ long. The diaphragms are composed of one layer of polygonal cells. The breadth of the vertical filaments varies from 4 to 23μ; they run in the interior of the joints, and are ramified, sending out branches in all directions, some of them approaching the cells of the wall and running along these. Here and there spherical gland cells are present. The tetraspores occur scattered over the surface of the thallus. The cystocarps (Fig. 7b) are relatively small, depressed-subspherical, and about 500μ high and 600μ broad.

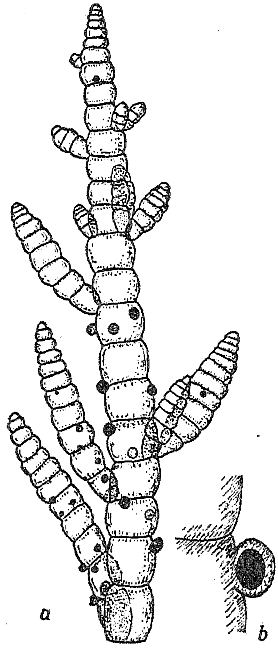


Fig. 7. *Champia indica* Boergs.: a, part of a female plant; b, cystocarp (a, × 4·5; b, × 26).

INDIA: Dwarka, dredged at a depth of about 8 metres; Okha Port, cast ashore, *Boergesen* 5530 (type); Karachi, December 1859,

---

*Boergesen, Mar. Alg. D.W.I. ii. 410, fig. 394 E.

W. J. Pullen (Herb. Kew.); *A. B. Kotwall* (Herb. New York Bot. Garden).

Champia parvula (*Ag.*) *Harv.* Nereis Bor. Am. ii. 76.—*Chondria parvula* Ag. Syst. Alg. 207.

Found a few times in the littoral region in exposed and rather sheltered localities. Most of the specimens are sterile; specimens with antheridia were found at the end of February and tetrasporangia in January.

INDIA: Okha Port (cast ashore); Tuticorin; Hare Island.

Distr. Seems to occur in most warm seas.

SPHAEROCOCCACEAE.

Sarcodia dichotoma *Boergs.* sp. nov.; *Sarcodiae marginatae* J. Ag. proxima sed thallo magis gelatinoso, regulariter dichotomo, summis ramorum acutioribus et prolificationibus numerosis saepe praesentibus distincta.

Thallus planus, circiter 20 cm. altus, flabellatim dichotome ramosus circiter 0·5–0·75 cm. latus, e margine frondis prolificationes saepe numerosas gerens. Planta obscurius brunneo-purpurea, carnoso-gelatinosa, exsiccatione chartae bene adhaerent.

INDIA: Karachi, *J. A. Murray* (type in Kew Herb.). Manora near Karachi, Miss *L. Here* (Kew Herb.); *A. B. Kotwal* (Herb. New York Bot. Garden).

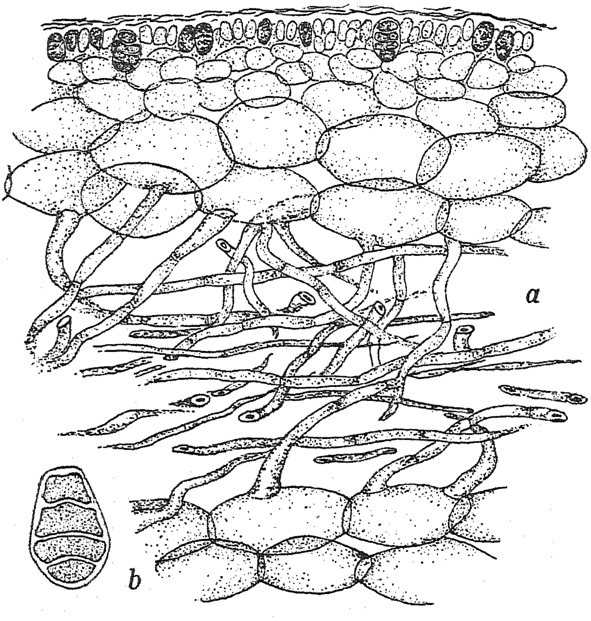


Fig. 8. *Sarcodia dichotoma* Boergs.: a, transverse section of tetrasporic thallus; b, a tetrasporangium (a, × 110; b, × 400).

In the Kew Herbarium three specimens are present; two of these are richly provided with proliferations along the margin of the thallus, one of which (the type specimen) is figured on Plate V; the third specimen is almost destitute of proliferations. A most proliferous specimen is also found in the collection of the New York Botanical Garden. All the specimens are tetrasporic, the zonately divided tetrasporangia (Fig. 8) are developed in the cortical layer. The thallus increases by the fountain type method. A transverse section (Fig. 8a) shows at the periphery a cortical layer of small oblong cells which passes over into a parenchymatic tissue of roundish cells, the bigger ones found innermost; in the middle numerous filaments are woven together.

As mentioned above the plant is nearly related to *S. marginata* J. Ag. and also to *S. ceylanica*; but it is easily distinguished from these by the characters mentioned above and by the fact that only the Indian plant adheres strongly to the paper.

PLOCAMIACEAE.

Plocamium coccineum (*Huds.*) *Lyngb.* Tentam. Hydrophytologiae Dan. 39, t. 9 B (1819). For literature see Rosenvinge, Mar. Alg. Denm. 599. *Fucus coccineus* Hudson, Flora Anglica, ii. 586 (1778).

Two specimens are present in the collection of the Kew Herbarium; one of them, collected in October 1880, has cystocarps.

INDIA: Karachi, 1880 and Manora near Karachi, 1881, *J. A. Murray* (Kew Herb.).

Distr. North Atlantic southwards to the Canary Islands, Mediterranean Sea, South Africa (?), New Zealand (?), Tasmania (?).

Plocamium Telfairiae *Harv.* in Kützing, Spec. 885 (1849); J. Agardh, Spec. ii. 400; Yendo, Bot. Mag. Tokyo, xxix. 111 (1915), where literature is quoted.—*Thamnophora Telfairiae* Harv. in Hooker Journ. Bot. i. 147, t. 125.

It is characteristic of this species that each sympodium carries only two branches, of which the uppermost continues in the same direction as the main stem. In this way we get alternately on each side of the main stem, the spinelike branchlet (i.e. the summit of the shoot pushed aside) and one ramified branch, whereas in *Plocamium coccineum* the rule is two ramified branchlets (*cf.* Oltmann, Morphologie, 598: 1907). I have seen two specimens of this species, one of which consists of several small young plants with broader thallus, while the other is a rather big specimen about 12 cm. high and is tetrasporic. A remarkable feature of this specimen is the fact that it is more or less covered with small proliferations growing out nearly everywhere from the tips of the branchlets. Most probably these proliferations serve as organs of vegetative propagation.

INDIA: Karachi, *A. B. Kotwall.*

Distr. Mauritius, New Zealand, Tasmania, New Holland, Japan.

Gracilaria foliifera (*Forssk.*) *Boergs.* in Dansk. Bot. Arkiv. viii. no. 2, p. 7, fig. 1 (1932).—*Fucus foliifer* Forsskål, Fl. Ægypt.-Arabica, 191. *Fucus lacinulatus* Vahl, Skrivter af Naturh. Selskabet, v. (1802). *Gracilaria lacinulata* (Vahl) Howe in Britton and Millspaugh, The Bahama Flora, 562; Boergesen, Mar. Alg. Dan. West Indies, ii. 379. *Fucus aeruginosus* Turner, Fuci, 147. *Gracilaria multipartita* (Clem.) J. Ag. Alg. Mediterran. 151.

As I have pointed out in the above cited paper Forsskål's name of this plant must be adopted. In the Botanical Museum at Copenhagen we have a very good specimen of Forsskål's from the Red Sea, which much resembles Turner's figure cited above.

In my collection of Indian algae I have found only a few specimens which can be referred to this species. One of these is a female plant, with a thin thallus and rather broad and irregularly divided segments; the other specimens have narrower segments.

India: Ohka Port (cast ashore). Bombay: Colaba (leg. *S. C. Dixit*).

Distr. Warmer Atlantic coasts of Europe and America, Mediterranean Sea, Red Sea, Indian Ocean, etc.

Gracilaria corticata *J. Ag.* Spec. Alg. ii. 602; Epicrisis, 423; Zanardini, Plant. Mar. Rubr. no. 80, p. 57, pro parte.—*Rhodomenia corticata* J. Ag. in Linnaea, xv. 14.

As pointed out by J. Agardh this species, although very closely related to the preceding, nevertheless differs in its more regularly dichotomous and fastigiate thallus which is of a more firm and cartilaginous consistency. The plant grows in tufts reaching a height of about 20 cm. The colour is dark violet red, and the specimens are rigid and cartilaginous with the exception of the upper, younger parts of the thallus which are less rigid and adhere somewhat to the paper. The thallus is more or less regularly di-tripartite, the segments are narrow, 1–2 mm. broad, under the furcations 3–4 mm. The apices of the segments are acute. Proliferations given out from the edges of the thallus are found now and then.

In the Kew Herbarium several specimens of a smaller and more robust form are present; they are about 6–7 cm. high, and the segments up to about 4 mm. broad.

The plant grows in the lower part of the littoral zone in exposed localities in dense tufts fixed to rocks and stones.

INDIA: Karachi, *J. A. Murray* (Kew Herb.); Manora, Miss *L. Here* (Kew Herb.); Dwarka; Carvar; Bengi Bay.

var. **ramalinoides** *J. Ag.*, Spec. Alg. ii. pt. i, p. 602; Epicrisis, 424.

Specimens of this variety form dark red tufts up to about 20 cm. high. The thallus is very much and irregularly divided, the branches becoming shorter upwards like short spines. The thallus is compressed. At the periphery there are one or two layers of small cells and within the cells gradually become larger.

The Indian specimens show much likeness to the figure of *Fucus lichenoides* Esp. which J. Agardh, l.c., quotes as belonging to this variety. The Indian specimens agree very well with Kützing's figure of *Gracilaria spinescens* (Tab. Phycol. xviii. t. 79) but the thallus of this species is terete.

The plant is common along the shores near Bombay and environs where its tufts are intermingled with those of *Sarconema furcellatum.* Female plants are found in the month of January.

INDIA: Bombay, Malabar Hill, Colaba, Back Bay, Bandra.

Distr. Indian Ocean, Red Sea.

CERAMIACEAE.

Callithamnion byssoides *Arn.* in Hooker, Brit. Flora, ii. pt. i, 342 (1833); Harvey, Manual, 178 (1849); Boergesen in Bot. Tidsskr. xxx. 11 (1909); Mar. Alg. D.W.I. ii. 218–220, figs. 205–207.

Referring to my papers quoted above where the literature is mentioned I merely point out that the Indian specimens seem to agree quite with the West Indian plant. The main stems are about 150μ thick, the cells of these are thickest near the crosswall and have very thick walls; upwards the filaments taper gradually, being in the tips of the filaments 4–5μ only. In many of the apices of the filaments thin short hairs are present; compare Rosenvinge's figure 266 (Mar. Alg. Denmark, pt. 3, p. 340) where the plant is called *Callithamnion Furcellariae.* Female and antheridial plants occur. It was found epiphytically upon *Neurymenia fraxinifolia.*

INDIA: Tuticorin.

Distr. North Atlantic Ocean, Canary Islands, Mediterranean Sea, West Indies, Guadelupe Island in the Pacific.

Spyridia alternans *Boergs.* sp. nov.; *Spyridiae complanatae* proxima, quae tamen ramificatione diversa et magis evoluta, habitu plumoso, inter alia a specie nostra distincta est.

Thallus caespitosus, irregulariter ramosus, circiter 25 cm. altus et ultra, articulatus et corticatus, in inferiori parte circiter 1½ mm. latus ad apicem gradatim attenuatus, compressus, ramis, et (in superiore parte ramorum) ramulis distiche instructis. *Ramuli* singuli ex omni articulo ramorum orti, alternantes, breves, ex articulis 8 compositi, ad genicula corticati, circiter 250–300μ longi, in parte basali 50μ lati, in summis circiter 20μ lati, aculeis 2–4 recurvatis armati.

INDIA: Karachi, *J. A. Murray* June 1884 (Kew Herb.); *A. B. Kotwal* (Herb. New York Bot. Garden); Manora near Karachi, Miss *L. Here* (Kew Herb.).

Of this species I have seen only two well prepared specimens, a small one found in the Kew Herbarium and a larger specimen (Plate VII) found in a collection of Indian Algae which Dr. M. A. Howe, New York Botanical Garden, sent me for determination. I have also seen a few specimens, most probably cast ashore, destitute of ramuli, belonging to the Kew Herbarium. It is a most irregularly branched plant of a rather dark red colour reaching a height of about 25 cm. The plant (Fig. 9) is markedly distichous: branches as well as ramuli issuing from the edges of the thallus which to judge from dried material is very much compressed. The main branches are about 1·5 mm. thick near the base, tapering slowly upwards. The ramuli are shed early, being found only in the upper ends of the branches. The main branches become corticated rather quickly. In the ramuli the cortical layer forms annular coverings above the cross walls. As a rule the short ramuli are composed of 8 big cells, and ended in 2–4 curved spines. The ramuli are placed alternately on each side of the branches one upon each segment (Fig. 9). The specimens I have seen were sterile.

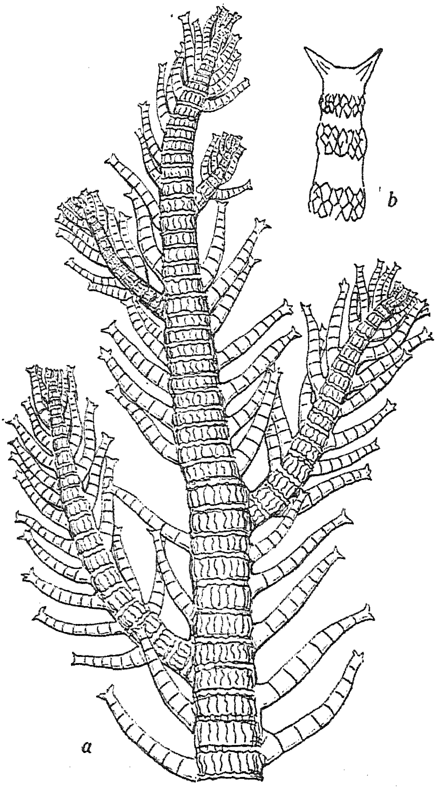
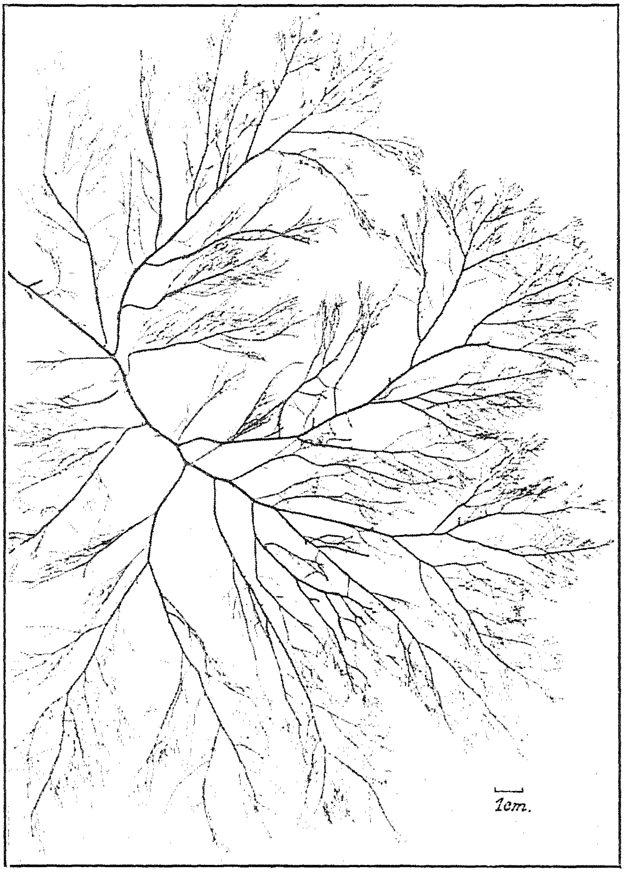


Fig. 9. *Spyridia alternans* Boergs.: a, part of thallus; b, upper end of ramulus (a, × 34; b, × 188).

Spyridia insignis J. Ag. Spec. Alg. ii. 344; Epicr. 272.—*Spyridia ericoides* Kütz. Spec. Alg. 668; Tab. Phycol. xii. t. 52.

A tetrasporic specimen is present in a collection of Indian algae most kindly sent to me for determination by the Director of the British Museum (Nat. Hist.) London.

PLATE VII



Spyridia alternans Boergs.

INDIA: Cape Comarin, *Parthasarathy Iyengar*, Sept. 1920. This species had been collected previously by *Wight* near Madras.

Distr. India, Cape.

DELESSERIACEAE.

Caloglossa Leprieurii (*Mont.*) *J. Ag.* Epicr. 499.—*Delesseria Leprieurii* Mont. in Ann. Sc. Nat. Bot. sér. 2, xxiii. 196, t.v. fig. 1.

Well developed tetrasporic specimens are found in the littoral zone on exposed coast in January.

Together with the following species and other small creeping algae it forms on the rocks extensive low cushions in which much sand and mud are accumulated.

INDIA: Bombay, Malabar Hill facing the Arabian Sea.

Distr. Widely distributed in warmer seas.

Caloglossa bombayensis *Boergs.* sp. nov.; *Caloglossa zanzibariensi* Goebel* proxima sed haec species (a nostra) thallo latiore,

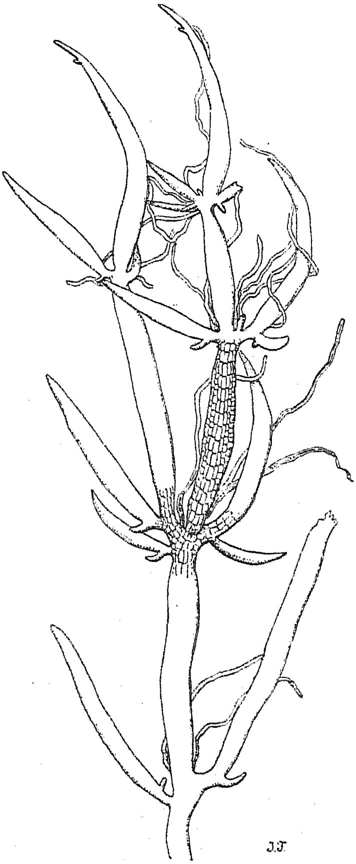


Fig. 10. *Caloglossa bombayensis* Boergs.: part of a plant (× 22·5).

---

*In Flora, lxxxv. 65 (1898).

seriebus cellularum in utroque latere costae magis evolutis, apicibus thalli magis curvatis imprimis diversa est.

Frons repens, caespites densas formans, subdichotome ramosa, irregulariter nodoso-articulata, in latere nodorum prolificationes plus minus numerosas et deorsum rhizoideas emittens. *Thallus* costatus, angustus, ad 200 μ latus et 70 μ crassus, e segmentis ab utraque parte attenuatis compositus. *Segmenta* e costa media et utrobique lamina monostromatica angustissima composita.

INDIA: Bombay, Malabar Hill on exposed rocks in the littoral zone, *Boergesen* 5208 (type).

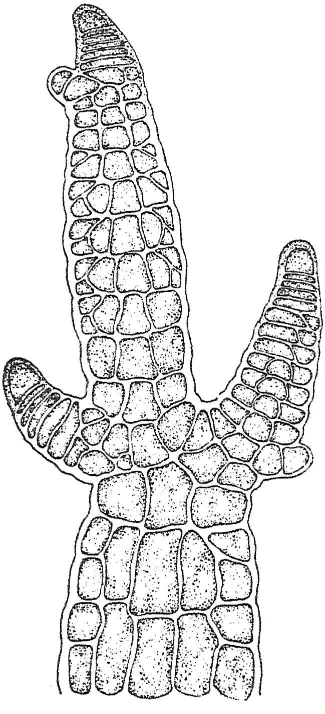


Fig. 11. *Caloglossa bombayensis* Boergs.: apex of thallus showing development of branches (× 375).

This elegant small plant (Fig. 10) forms dense, low, mosslike tufts upon the rocks to which it is fixed by means of numerous strong rhizoids given out from the nodes. The ramification is rather irregular, as the joints are of different lengths. The thallus is not much narrowed at the nodes. At the apex the thallus is at first cylindrical but transverse sections (Fig. 12) show that it soon becomes oblong and at last, when the marginal cells are formed, lengthened-elliptical. From the nodes the branches are given off. These are not really opposite but as in *Caloglossa amboinense* Karsten* they

---

*In Bot. Zeit. xlix. 265, t. 5 (1891).

issue opposite to each side, one from each of two neighbouring segments (Fig. 11). Later on several adventitious shoots are given out and these are in most cases developed near the base of the preceding ones on the outer side of them (Fig. 10). By this type of ramification a short, thick, sympodially built up, somewhat curved branch-system is formed giving the older nodes a very characteristic appearance. The development of the thallus is performed very similarly to that of *Caloglossa amboinensis*. The thallus grows by means of a large apical cell from which segments are successively cut off (Fig. 11). When the segments have reached some size they are divided successively in a central and 4 pericentral cells of which the two on both sides of the central one are the biggest and first formed (Fig. 12a), while the other two are smaller and lie above and below the central cell. All together these cells form the midrib of the thallus and are all of the same length. Then the upper and lower corners of the large pericentral cells are cut off and these cells are again divided a few times forming the flanks on both sides of the midrib (Fig. 11). As a rule three rows of cells are formed on both sides of the midrib, in rare cases four (Fig. 10).

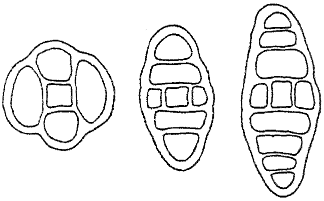


Fig. 12. *Caloglossa bombayensis* Boergs.: transverse section of thallus (× 165).

As is mentioned above this small *Caloglossa* is very nearly related to *C. zanzibariensis* Goebel. I am able to state this definitely as I have examined an original specimen, and I wish to thank Professor Dr. K. Goebel and Dr. v. Schwenau, Keeper of the Bayerisches Staatsherbarium, most warmly for allowing me to see this specimen. The examination showed that the adult thallus, which as stated by Goebel reaches a breadth of 250–400 μ, consists on both sides of the midrib of a lamina composed of 8 rows of cells and thus as a rule more than double that found in the Indian plant and as the cells in the African plant are moreover somewhat bigger than those found in the Indian plant, the thallus naturally becomes much broader. The apex of the Indian plant is curved somewhat downwards but not so much as is the case in the other species as figured by Goebel. I may add that of the species of *Caloglossa* hitherto known, the African plant comes nearest to *C. Ogasawaraensis* Okamura (in Bot. Mag. Tokyo, xi, 12 : 1897) but this plant is much broader (2–3 mm.) and the segments are much narrowed at the nodes, thus becoming ellipsoid in shape.

Membranoptera Murrayi *Boergs.* sp. nov.; *Membranopterae alatae* proxima, sed thallo angustiore et tenuiore, venis lateralibus microscopicis imprimis distincta.

Planta ad 12 cm. alta et ultra (?), subdichotome ramosa, costata, colore roseo-rubra. *Segmenta* linearia, 1½–2 mm. lata, ala angustiore et venis microscopicis instructa. *Cystocarpia* et *antheridia* ignota. *Tetrasporangia* in utroque latere costae segmentorum terminalium exstant. *Substantia* tenuis, ita ut specimina exsiccata chartae arcte adhaereant.

INDIA: Karachi, June 1883, *J. A. Murray* (Type [Plate VIII] in Kew Herb.). Sind coast, *Y. V. Paul*, 22/4/1927 (Kew Herb.).

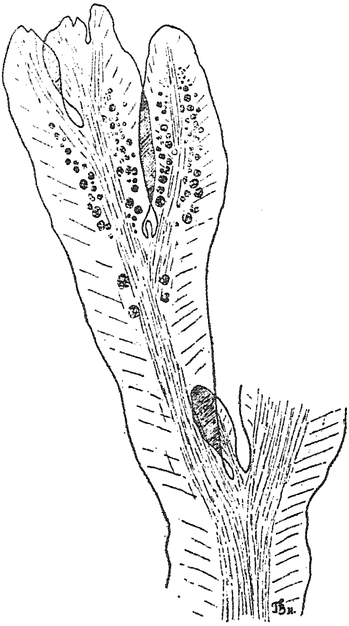


Fig. 13. *Membranoptera Murrayi* Boergs.: part of thallus with tetrasporangia (× 13·5).

The structure of the Indian plant (Fig. 14) seems to agree with that of *Membranoptera alata* according to the published descriptions especially those of WILLE,* KYLIN,† and ROSENVINGE.‡ According to KYLIN the structure of the thallus in *M. alata* is very like that in *Delesseria sanguinea*, but it differs in the absence of intercalary divisions, in the lateral pericentral cells not being transversely divided, and finally in the branching of the thallus taking place

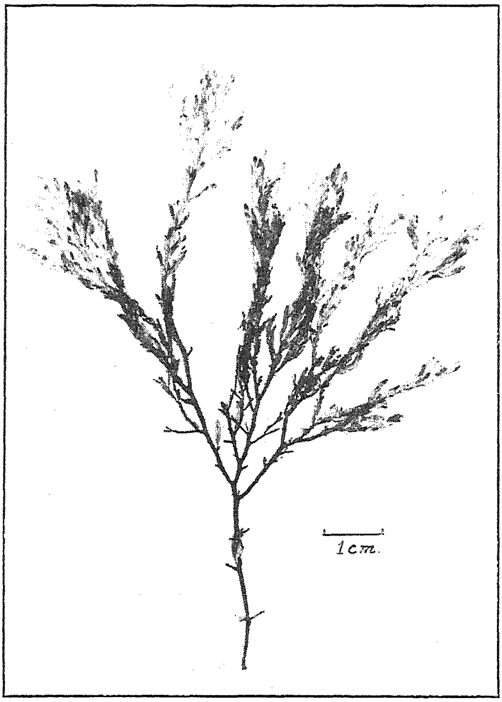
---

*WILLE, N. in K. Svenska Vet.-Akad. Handl. xxi. Stockholm (1885), and in Nova Acta Leop.-Carol. deutsch. Akad. lii., Halle (1887).

†KYLIN, H. in K. Svenska Vetenskapsakad. Handl. lxiii. Stockh. 108 (1923).

‡ROSENVINGE, L. K. Mar. Alg. Denm. pt. 3, p. 481.

PLATE VIII



Membranoptera Murrayi Boergs.

through the transformation of secondary apical cells into primary ones. These features also occur in the Indian plant, and its whole habit is very like that of *M. alata.* But some differences appear to be present. (I have seen only three dried specimens and therefore I do not know its possible variation.) Thus the thallus in the Indian plant is slenderer and thinner. It is about 1½–2 mm. broad and retains almost the same breadth from the apical ends downwards until only the midrib is left. On account of its thinner thallus the plant adheres strongly to the paper, whereas *M. alata* usually does not or at most very badly. Further the colour is lighter ; the dried specimens in their upper parts are light rosy-yellow and darker red below, but not the dark almost scarlet colour found in *M. alata.* The veins are much less developed being microscopical whereas in *M. alata* they are easy to see by means of a lens. They are arranged as in *M. alata,* those of second order emerging from the lower side of those of first order (comp. ROSENVINGE, l.c. fig. 446). Adventitious shoots are common in the axils of the branches. The midrib is less developed and not so thick as in *M. alata.*

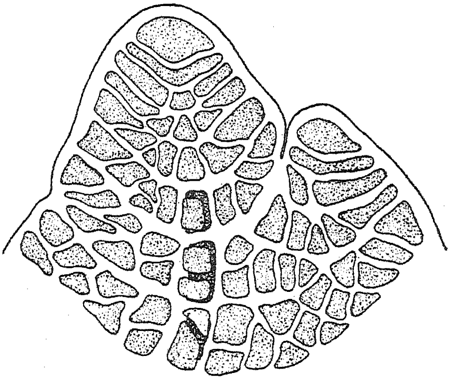


Fig. 14. *Membranoptera Murrayi* Boergs.: apex of thallus (× 450).

The specimens are tetrasporic. The tetrasporangia are formed in long rather narrow belts on both sides of the midrib in the upper end of the lobes of the thallus (Fig. 13) ; they are also found in the adventitious branchlets but these are less common in the Indian plant. According to ROSENVINGE the tetrasporangia in *M. alata* occur especially in the adventitious branchlets and the sori seem also to be broader and of more irregular shape (comp. KYLIN'S figures, l.c. p. 109, fig. 69, 1923). When to these differences is added the geographical distribution I think it is justifiable to consider the Indian plant a different species. But it is a very interesting fact that a plant so closely related to *M. alata* is found in the Arabian Sea. I have named the Indian plant after its discoverer, who, to judge from the collection of algae which the Director of Kew has placed at my disposal, has gathered many interesting species of algae in the environs of Karachi.

Claudea elegans *Lamx.* in Ann. du Muséum, xx. t. 8, figs. 2–4 (1813); J. Agardh, Spec. Alg. ii. 1275. For synonyms see De Toni, Syll. Alg., iv. 748.

A fine but sterile specimen of this elegant plant occurred in a small collection of algae, which Mr. A. B. Kotwall, Karachi, most kindly has sent me. The hitherto known distribution of this species is the shores of Tasmania and South-West Australia and finally Ambon, where Mme. Weber found a small specimen in a collection of algae made by the Danish expedition to the Kei Islands. Its occurrence so far from its known area is therefore of much interest and forms an important addition to the number of species common to these far-off areas.

INDIA: Coast of Sind: Karachi, *A. B. Kotwall.*

Distrb. Tasmania, S.W. Australia, Ambon.

RHODOMELACEAE.

Falkenbergia rufolanosa (*Harv.*) *Schmitz* in Engler u. Prantl, Natürl. Pflanzenfam. i, Abt. 2, p. 479 (1897); Falkenberg, Rhodomel. 690; Yendo in Bot. Mag. Tokyo, xxx. 62 (1916); Kützing, Tab. Phycol. 14, t. 54 f, g.

As mentioned by Yendo (l.c.) *Falkenbergia Hillebrandii* (Bornet) Falkenb. so much resembles *F. rufolanosa* that they probably represent the same species, and the figures of one of the latter* can just as well be used for *F. rufolanosa.* The Indian specimens are about 40μ (rarely a little more) thick in the main stems, decreasing to about half this size in the upper young filaments; thus they have the same breadth as that given by Yendo for his specimens. The segments were often thickest in the middle. The specimens were sterile. Twice and in very different localities I have met with this plant. In one of them it was growing upon dead crusts of Corallines on rocks near high water mark in a very exposed locality during the monsoon. In the other locality it was found in deep sea upon shells of the pearl-mussels taken up by divers.

INDIA: Dwarka, the pearlbank near Tuticorin.

Distr. Australia, Japan, Malay Archipelago, Atlantic Ocean (?).

Chondria tenuissima (*Good.* et *Woodw.*) *Ag.* Spec. Alg. i. 352. For more literature compare De Toni, Syll. Alg. iv. 834.—*Fucus tenuissimus* Good. et Woodw. in Linn. Trans. iii. 215, t. 19.

Two specimens, one of which (gathered in March) is tetrasporic, are present in the Kew Herbarium.

INDIA: Karachi, *J. A. Murray.*

Distr. North Atlantic, Mediterranean Sea, California, Tongataba, Honolulu, etc.

---

*Compare for instance my figures in Mar. Alg. D.W.I. 332-3 and Kylin's in Bot. Notiser, 1928, 236. Kylin points out that *Falkenbergia Doubletii* Sauvag. is conspecific with *Falkenbergia Hillebrandii*, but J. Feldmann in Contrib. à la Flore algolog. marine de l'Algérie (Bull. Soc. d'Hist. Nat. de l'Afrique du Nord, 246, t. 22: 1931), who does not quote Kylin, pleads for the separation of these two species.

Chondria dasyphylla (*Woodw.*) *Ag.* Compare Indian Rhodophyceae: II, Kew Bulletin, 1932, 113.

Two tetrasporic specimens found in the Kew Herbarium and determined as *Chondriopsis* near *C. Harveyana* are referable to this species.

INDIA: Karachi, *J. A. Murray*, 6/83.

var. **stellata**, var. nov.; a var *typica* var. *stellata* praecipue differt ramulis tetrasporangiiferis in fasciculis praesentibus, ramificatione magis irregulari.

Compared with the typical form the Indian plant (Plate IX) is more irregularly ramified, and the branches are given out on all sides, some being short and some long. Some of the branches are far apart, some quite near together. They may be little or much branched; all are more or less curved.

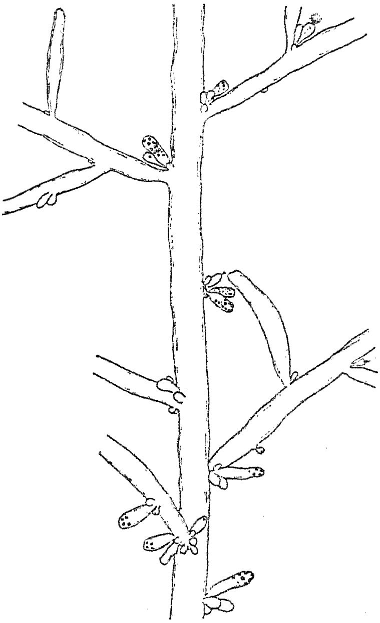


Fig. 15. *Chondria dasyphylla* (Woodw.) Ag. var. *stellata* Boergs.: part of thallus with tetrasporic stellately placed ramuli (× 2·6).

The fascicles of the adventitious, fructiferous ramuli make the plant look still more irregular. The ramuli (Fig. 15) are developed upon the large main filaments as well as upon the minor branches. They are scattered without order upon the filaments either far from the branches or at the base of them.

A transverse section of the thallus (Fig. 16) shows 5 pericentral cells encircled by big cells of about the same size as the pericentral cells, the cells outside these becoming abruptly much smaller. This variety reminds one somewhat of *Chondria nidifica* Harv. on account of the small stellate fascicles formed by the short fructiferous ramuli; but the ramification of the Indian plant is very different.

From typical *C. dasyphylla* it differs especially by its more irregular ramification and by the fascicles of fructeriferous ramuli; in the typical form the ramuli occur as a rule solitarily, but as is pointed out by Hauck (Meeresalgen, 210) in the typical form several ramuli may grow out together especially near the base of the branches.

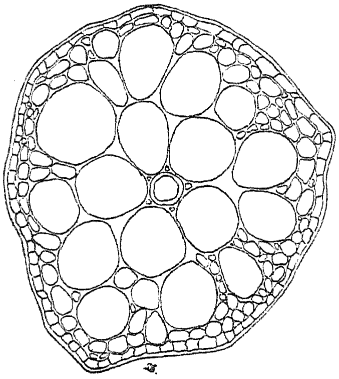


Fig. 16. *Chondria dasyphylla* (Woodw.) Ag. var. *stellata* Boergs.: transverse section of thallus (× 140).

In the collection of algae from the New York Botanical Garden there is a specimen coming near to this variety having the ramuli sometimes placed in small groups and with more irregular ramification.

INDIA: Dwarka.

Acanthophora Delilei *Lamx.* Essai Thalassioph. 44; J. Agardh, Spec. Alg. ii. 817.

This species seems to be common on the coast of India along the Arabian Sea. It grows a little below low water mark in exposed and rather sheltered places. All my specimens were sterile, but specimens from Karachi gathered in December have cystocarps.

INDIA: Karachi, Dec. 1859 *W. J. S. Pullen* (Herb. Kew); Okha Port; Bombay from several localities; Tuticorin, Hare Island; Pambam, Oct. 1922, *W. Parthasarathy Iyengar* (Herb. Brit. Mus.).

Distr. Mediterranean Sea, Black Sea, Red Sea, shores of Somali.

Laurencia papillosa (*Forssk.*) *Grev.* Alg. Brit. p. lii (1830); J. Agardh, Spec. Alg. ii. 756; Kützing, Spec. Alg. 655, and Tab. Phyc. xv. 62; Boergesen, Mar. Alg. D.W.I. 246, fig. 236.—*Fucus papillosus* Forssk. Fl. Ægypt.-Arab. 190.

The Indian specimens agree quite well with this species as to shape and appearance, and resemble to a great degree both Kützing's figure above quoted and the original specimen in Forsskål's

Herbarium. The specimens show the palisade-like shape of the peripheral cells, as I have described and figured it (l.c.). Lenticular thickenings are not present.

My specimens were gathered in the lower part of the littoral zone in very exposed localities.

INDIA: Bombay (Malabar Hills facing the Arabian Sea !). Pamban, *Parthasarathy Iyengar* (British Museum).

Distr. Warmer Atlantic Ocean, Mediterranean and Red Seas, Indian Ocean, etc.

Laurencia cruciata *Harv.* in Trans. Irish Acad. xxii. 544, and Phyc. Austr. Syn. no. 311; J. Agardh, Epicrisis. 652; Yamada, Notes on *Laurencia*, 198, fig. E.

To this species I have referred some specimens which I gathered at Dwarka. The specimens are caespitose, about 13–14 cm. high, of rather cartilaginous consistency, and of dirty yellow brown colour in dried specimens. The thallus is terete, and a transverse section shows that the peripheral cells are palisade-like with thick walls as in Yamada's figure. Lenticular thickenings are not present. I may add that I have compared my specimens with those in J. Agardh's Herbarium in Lund and found that they are very like his examples from Encounter Bay and George Town, Tasmania, having, when dry, the same horny consistency and dark-brown colour.

INDIA: Dwarka.

Distr. West Australia.

Laurencia pannosa *Zan.* Phycearum Indic. Pugillus, 11, t. 6 B, figs, 1–2 (1872); Yamada, Notes on *Laurencia*, 199.

The Indian specimens seem to agree quite well with Zanardini's description and figures. The plant forms crustlike cushions in exposed places upon rocks to which are fastened by means of numerous discs the more or less decumbent and interwoven filaments of the thallus, and by means of such discs the filaments are also connected with each other. The thallus is very irregularly ramified on all sides. The thicker filaments are about 350μ thick. A transverse section shows that the peripheral cells are roundish-quadrangular, but when seen from above are roundish-oblong, with a diameter of about 50μ. Lenticular thickenings are present in the medullary tissue.

INDIA: Dwarka.

Distr. Malayan Archipelago.

Laurencia obtusa (*Huds.*) *Lamx.* var **majuscula** *Harv.* Phycol. Austr. Synopt. Cat. no. 309 b; Yamada, Notes on *Laurencia*, 223.

As mentioned in his valuable monograph, Yamada during his stay in Berkeley, California, saw a specimen of this plant in a collection of algae which one of the young Indian students, whom I met in India, had sent to Professor Setchell. Professor Setchell has most kindly allowed me to see this specimen, and I find it agrees entirely with mine. The plant forms dense tufts up to about 15 cm. It has a beautiful scarlet-red colour and a rather soft carnose consistency adhering closely to paper. It is abundantly ramified to all sides. The branches and branchlets are clavate. The thallus is terete with a percurrent axis and paniculate outline. A transverse section shows that the peripheral cells are about as long as broad with rounded corners. Lenticular thickenings are not present. The surface cells project very much near the end of the branchlets, as pointed out by Yamada.

INDIA: Dwarka, in rock pools near low water mark.

Distr. Warmer Atlantic, Pacific and Indian Oceans.

Laurencia pedicularioides *Boergs.* sp. nov.; *Laurenciae spectabili* Post. et Rupr. promixa sed differt ramificatione diversa, pinnulis magis evolutis saepe subdivisis, series longas in utroque latere ramorum formantibus, substantia carnosa, colore roseo-rubro.

Frons usque ad 15 cm. alta et ultra, complanata, 3–4 mm. lata et 1 mm. crassa, distiche pinnato-ramosa. *Rami* hic illic irregulariter evoluti. *Pinnae* plerumque circiter 3 mm. longae, interdum ad ½ cm. et ultra, in parte basali angustiores, apicem versus latiores, mox indivisae et late rotundatae, mox in 2–3 lobos divisae. *Tetrasporangia* in superiore parte pinnarum formata, globosa, permagna, circiter 120μ lata. *Substantia* carnosa; specimina exsiccatione chartae arctissime adhaerent. *Cystocarpia* et *antheridia* ignota.

INDIA: Dwarka. *Boergesen* 5449 (type).

This plant (Plate IX) is certainly closely related to the Californian *Laurencia spectabilis* Post. et Rupr. Large forms of *Laurencia pinnatida* (Gmel.) Lamx. also come near to this species, for instance the fine large form found at Clare Island on the West coast of Ireland. But the ramification of the Indian plant is different and the pinnae are not so much developed. As regards the anatomy of the Indian plant the peripheral cells are roundish polygonal. The cells of the medullary layer have rather thick walls, but I have not found any lenticular thickenings. The plant was found near low water-mark and had tetrasporangia in January. Plants with antheridia and cystocarps have not been found. The older parts of the thallus are dark red and more or less densely covered with epiphytes, whereas the younger parts have a fine rosy-red colour.

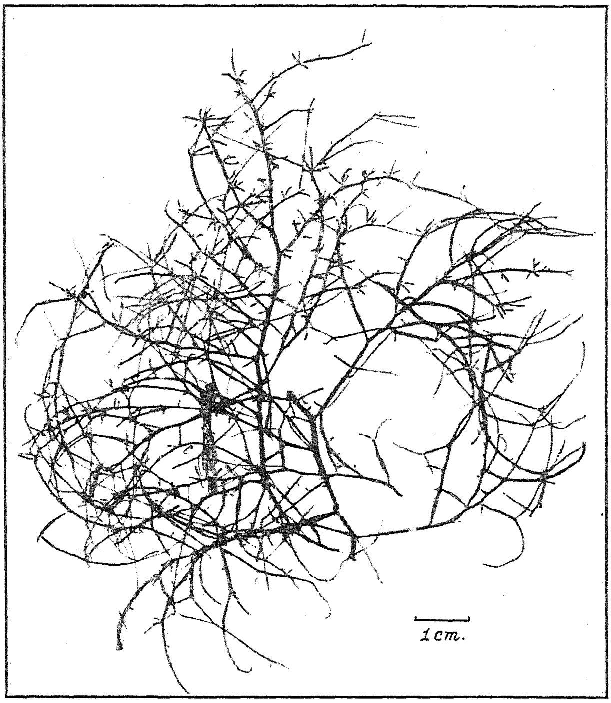
Dictyurus purpurascens *Bory* in Belanger, Voyage, 170, t. 1, fig. 2; J. Agardh, Spec. Alg. ii. 1245. Falkenberg, Rhodomelaceen, 675.

In the somewhat polluted water in the environs of Tuticorin the plant was dredged at a depth of about only 2 fathoms; Mme. Weber says she found it at a depth of 30 metres. My specimens were sterile. The species is described upon specimens from India (Cap Comorin) collected by Belanger.

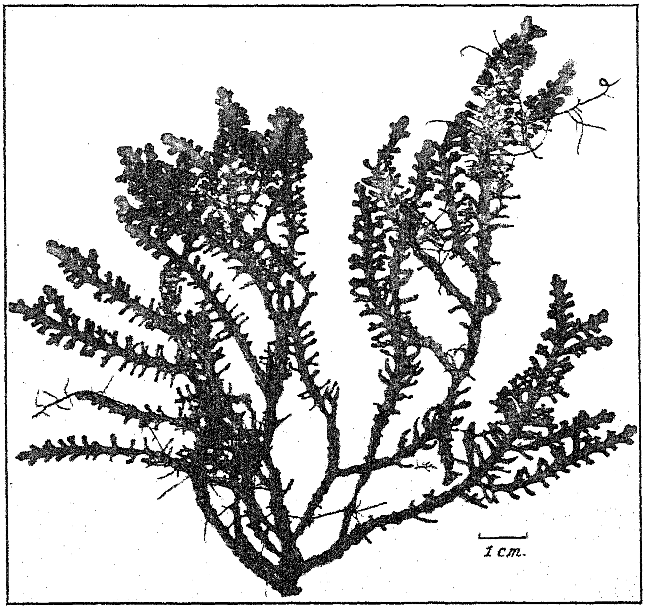
INDIA: Tuticorin; Cap Comorin, *Belanger*; without locality, *Wight.*

Distr. Indian Ocean.

PLATE IX



Chondria dasyphylla (Woodw.) Ag. var. *stellata* Boergs.



Laurencia pedicularioides Boergs.

Neurymenia fraxinifolia (*Mert.*) *J. Ag.* Spec. Alg. ii. 1135; Falkenberg, Rhodomelaceen, 444, t. 7, figs. 20–29; Okamura, Illustrat. Alg. Jap. i. t. xiii (1901).—*Fucus fraxinifolius* Mert. in Turner, Fuci, t. 193. *Epineuron fraxinifolium* Harv. in Hook. Lond. Journ. Bot. iv. 532 (in note); Kützing, Tab. Phycol. xiv. t. 99. *Dictymenia fraxinifolia* J. Ag. in Linnaea, xv. 27; Harvey, Phycol. Australica, t. 124.

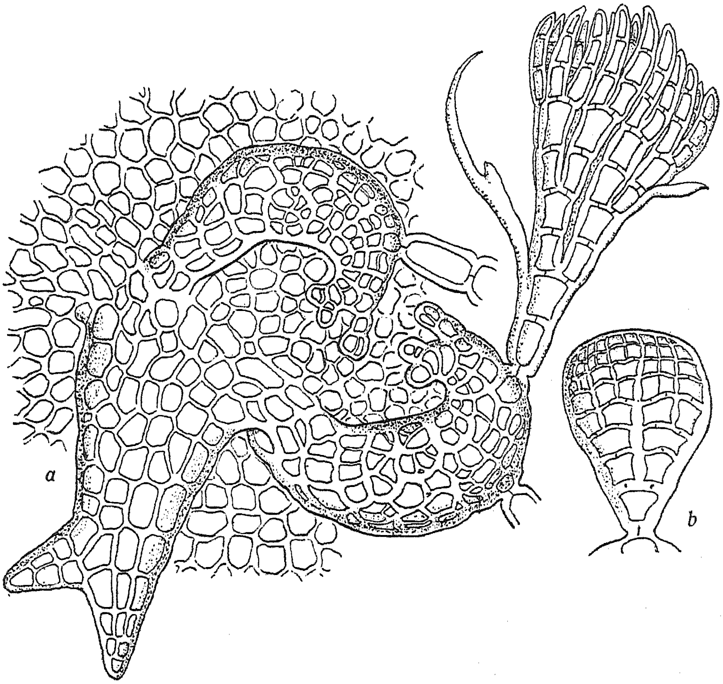


Fig. 17. *Neurymenia fraxinifolia* (Mert.) J. Ag.: a, part of the thallus with one adventitious branchlet of first order and two tetrasporic ones of second order with trichoblasts (× 225), b, a young trichoblast still surrounded by the solid cuticula which is burst in the larger trichoblast in figure a (× 300).

As regards the structure and building up of the thallus of this fine plant Falkenberg has given a detailed description. Falkenberg's material, however, was sterile. But Falkenberg was able to point out that the fructiferous organs are to be found in the secundary adventitious branchlets which he therefore designated as the "Fruchtäste," and he based this upon the fact that only in these branches are trichoblasts developed, at the same time referring to Harvey's figure. As described by Falkenberg the fertile branchlets are developed from surface cells round the base of the primary adventitious branchlets (Fig. 17a). The last mentioned have a radial structure, the secondary adventitious branchlets are dorsiventral. From most of the segments on the dorsal side of the fertile branchlets a trichoblast is given off. The figure shows this, as well as the development of the fertile branchlets. When young the trichoblasts, in accordance with the group *Amansieae*, form a dense, almost pear-shaped body surrounded by a common cuticle (Fig. 17b), and the cells in the trichoblasts remain short until the cuticle bursts during further growth and the trichoblasts grow out normally with long cells (Fig. 17a).

In my material I have found not only stichidia but also cystocarps and one antheridium. The tetrasporangia are formed in the two pericentral cells lying on both sides of the ventral one (see Fig. 18b).

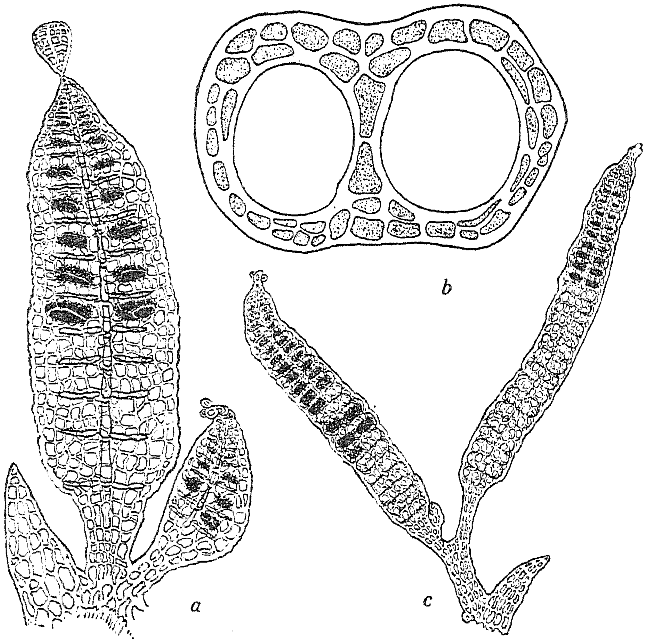


Fig. 18. *Neurymenia fraxinifolia* (Mert.) J. Ag.: a, short, broad stichidia with short stipes in a plant from South India (Tuticorin) ; b, transverse section of stichidium of the same plant ; c, long narrow stichidia with long branched stipe in a plant from Australia (a, × 83 ; b, × 248 ; c, × 68).

Harvey (l.c.) was the first to describe and figure the stichidia in more detail. It must be said, however, either that Harvey's figure and description were not very good or that the Australian plant differs much from the Indian. Harvey's description is as follows : " Stichidia are abundantly borne on the nerves ; they are narrow, linear, mucronate, simple or proliferously compound containing a double row of vertically flattened tetraspores."* But in my plant (comp. Fig. 18a), the shape of the fully developed stichidium is

---

*As to the compounded stichidia of Harvey's Falkenberg has his doubts. He writes : " Wenn Harvey den Muttersspross, an dem die Stichidien inserirt sind, nicht erwähnt, so kommt das wohl daher, dass dieser neben den kräftig entwickelten sporenbildenden Fruchtästen so zurücktritt, dass er von Harvey ganz übersehen werden, und Harvey aus dem gleichen Grunde auch direct von ' versweigten Stichidien' sprechen konnte." That the primary adventitious branchlets also are found in the Australian plant is shown by Fig. 18c.

elongated ovate or oblong with more or less rounded apex and a short stalk; the stichidium is somewhat compressed with two tetrasporangia in each segment; compound stichidia were not found. On account of these differences it would be of interest to examine specimens from other localities. The type-specimen of *Fucus fraxinifolius* Mertens, originating from Vahl's Herbarium and preserved in the Botanical Museum at Copenhagen (Turner, Fuci, t. 193), is tetrasporic. It is from "India orientalis," without definite locality. The stichidia in this specimen (comp. Turner's Fig. d) with the exception of some minor differences, are very like those in mine. They have the same shape, though often a little longer, the same breadth, about 220µ, and the rather large tetrasporangia (about 100µ long and 70µ broad). Furthermore the stichidia in the type-specimen have often a rather long stalk, whereas in mine it is quite short, and in the type-specimen I found one stichidium the upper part of the stalk of which bore a branch with a second stichidium.

Although Vahl's specimen showed some resemblance to the figure and description of Harvey's Australian plant, it differed greatly from it in some respects, and therefore I wrote to Kew asking for the loan of Harvey's specimens of *Neurymenia fraxinifolia*, and the Director of Kew kindly sent me the material from Australia and surrounding countries. In fine tetrasporic specimens from Freemantle, W. Australia (coll. W. Harvey and G. Clifton) the stichidia (Fig. 18c) are very long (up to 2½ mm.), slender, about 170µ broad, having almost the same breadth from the base to the apex and containing two long rows of densely placed tetraspores smaller than those in the Indian plant, namely about 85µ broad and 55µ high. In most of the stichidia a rather long, slender stalk is present; the upper end of the stichidia consists of a short, often curved attenuated sterile part with remnants of trichoblasts. Compound stichidia in which, as shown in Harvey's drawing, the fertile parts are branched were not found, but in one stichidium there is a branch given off from the upper end of the stalk (Fig. 18c) and in another there was not only one large branch from the stalk ending in a stichidium, but also 3 poorly developed branchlets. Even, therefore, if stichidia with branched stalks are rarely present, there are no compound stichidia as in Harvey's drawing, and, further, the shape of the stichidia is somewhat different. As regards the form from Nova Caledonia (Kützing, Tab. Phyc. xiv. t. 99, fig. 6) its stichidia resemble those of the Indian plant. And according to Okamura's figures (l.c.) Japanese specimens have rather acute but short and short-stalked stichidia.

The cystocarps were unknown until A. D. Cotton (Kew Bulletin, 1913, 254) referred to them as occurring on the adventitious shoots (whether primary or secondary could not be ascertained) which spring from the surface of the fronds. Later Mme. Dr. Anna Weber (Liste Alg. Siboga, 1923, 374) mentions the cystocarps in a specimen from Ceylon. As to the origin of the cystocarps they are said to be borne " sur les petites pousses cylindriques (les pousses adventives), qui se développent, soit au bord de la fronde, soit sur les veines latérales." It should be noted that the cystocarps are developed like the stichidia upon the dorsiventrally built adventitious branchlets of second order (comp. Fig. 19a). Although my material of the female plant was dried, I can state that the procarp is developed as with the *Rhodomelaceae* in the second basal cell of the fertile trichoblast. The trichoblasts destined to be fertile remain quite short, having only one undivided segment above the fertile one (Fig. 19b). During the further growth of the procarp this cell is easily seen on the upper side of the procarp. The trichoblasts form in the female fruiting branchlets a row along the dorsal side, one trichoblast as a rule being developed from every other segment, and in accordance with this the procarps also form a row along the dorsal side of the branchlets (Fig. 19); generally two to five procarps are formed on the same branchlet, but I have seen up to 9 in one row. In the phase of fertilization the procarps are obliquely obovate-urn-shaped, about 60µ broad and 70µ long; the trichogyne is long, vigorous, about 12µ thick, and 140µ long, a little thicker near the upper end. Of more or less ripe cystocarps I have seen only a few, and they seem to be always solitary. After fertilization the cystocarp destined to be developed increases much in size getting almost ball-shaped and the part of the branchlet below the cystocarp likewise gets much thicker and becomes a vigorous stalk. The undeveloped procarps are seen as remnants near the base.

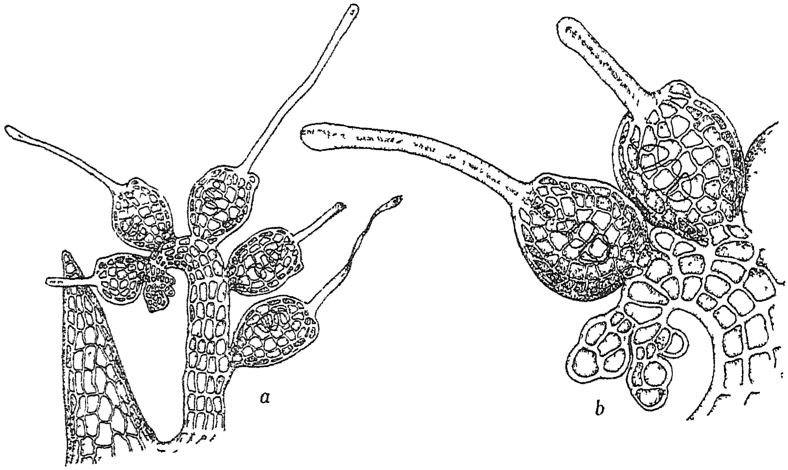


Fig. 19. *Neurymenia fraxinifolia* (Mert.) J. Ag.: a, a primary adventitious branchlet at the base of which is a fertile secondary adventitious branchlet with procarps; b, end of a fertile branchlet showing two young procarps behind the apical cell and two procarps nearly ready for fertilization (a, × 75; b, × 248).

I only found one antheridial body (Fig. 20a). With the exception of the basal cell it was formed by the whole trichoblast, which was divided into numerous branchlets giving rise at their summits to spermatia. The androphore is nearly spherical, and had a diameter of about 120μ. In addition to this nearly ripe androphore the branchlet bore two young ones from which it was seen that the segments in the trichoblasts above the basal cell become plurisiphonous (Fig. 20b). The branchlet with the androphores was found upon a small piece of a thallus which otherwise bore only young stichidia and in spite of search I was not able to find other androphores.

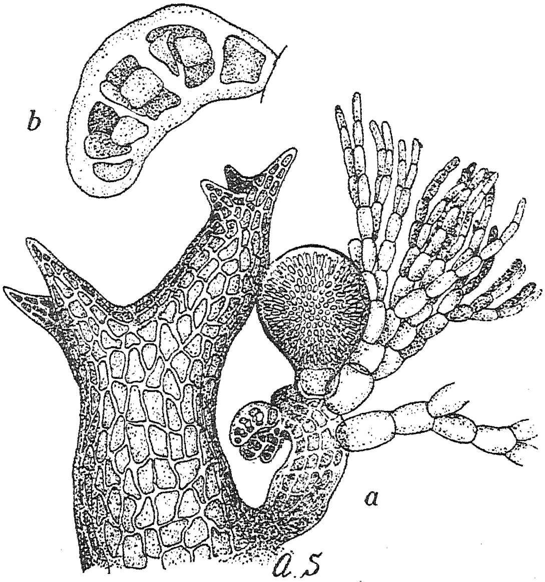


Fig. 20. *Neurymenia fraxinifolia* (Mert.) J. Ag.: a, primary and secondary branchlets, the last one bearing, besides trichoblasts, a nearly globular androphore and a few young ones; b, one of the last mentioned more magnified (a, × 110; b, × 500).

The genus *Neurymenia* has until now been considered monotypic, but the above mentioned differences as to the stichidia perhaps indicates the possibility of subspecies or varieties. It is not impossible that the vegetative thallus may exhibit differences (i.e. size of the marginal spines or distance between the nerves) and that these might prove to be constant for different geographical areas. Falkenberg has, moreover, alluded to the width of the thallus and has pointed out that forms with broader and narrower thallus are found. Specimens with narrow thallus should occur at the shores of Madagascar, Mauritius, India and Ceylon, and forms with broad thallus in Australia and Nova Caledonia. But, having seen the Kew collections, I believe a division based upon the size of the thallus does not hold good. In any case an examination of very ample material is necessary to decide all these points.

The plant was dredged in 2–3 fathoms of turbid water in the tranquil bay behind Hare Island near Tuticorin.

Distr. Indian Ocean, Japan, Australia, etc.

XV—TROPICAL AFRICAN PLANTS: X.*

Oxygonum fruticosum *Dammer* in Warb. Kunene-Sambesi Exped. 231 (1903), nomen nudum, et in Engl. Pflanzenw. Afr. iii. pt. 1, (Engl. u. Drude, Veg. der Erde, IX) 120, fig. 77c (1915), hic a *Milne-Redhead* discripta [Polygonaceae]; species ab omnibus congeneribus habitu elato fruticoso distinctissima, sed forma fructus *O. pubescenti* C. H. Wright affinis.

Frutex 0·9–1·4 m. altus; rami plus minusve virgati, adscendentes, lignosi, cortice brunneo reliquiis persistentibus ocrearum cinerearum partim tecto. *Ocreae* firme chartaceae, minutissime velutino-puberulae, cylindricae, truncatae, in toto 10–15 mm. longae, apice setoso-ciliatae, ciliis usque ad 8 mm. longis. *Folia* sessilia, lanceolata, valde acuta, basi cuneata, usque ad 4 cm. longa, 0·8 cm. lata, utraque pagina minutissime velutino-puberula, minutissime regulariter nigro-punctata, glauca. *Racemi* terminales, elongati, rigidi, circiter 25 cm. longi. *Bracteae generales* firme chartaceae, cylindricae, apice oblique truncatae, acute acuminatae, plerumque non setoso-ciliatae, glabrae vel minutissime puberulae, 7–10 mm. longae; bracteae propriae hyalinae, setis brevibus 1–2 instructae; pedicelli circiter 6 mm. longi. *Flores* ☿:—*Perianthii tubus* circiter 6 mm. longus, apicem versus leviter constrictus; lobi oblongi vel oblanceolati, circiter 8 mm. longi, apice valde acuti vel apiculati. *Stamina* 8; filamenta filiformia, 1·5–5·5 mm. longa; antherae circiter 1·3 mm. longae. *Ovarium* circiter 1 mm. longum, glabrum; styli 3, in toto circiter 9 mm. longi, apicem versus minutissime puberuli, parte inferiore in columnam 7 mm. longam connati; stigmata minuta, capitata. *Flores* ♂ non visi. *Fructus* oblongo-ellipsoideus, circiter 9 mm. longus, 5 mm. diametro, glaber, longitudinaliter sulcatus, transverse striatus.

NORTHERN RHODESIA: Mwinilunga District: on sand in open *Cryptosepalum* woodland about 60 Km. south of Mwinilunga, and 19 Km. west of River Lunga, 23 Aug. 1930, *Milne-Redhead* 947 (type); slender shrub, up to 1 m. high; flowers white or pinkish.

ANGOLA: Kulleis, Maramba, in white sand at the edge of the woodland, Oct. 1899, *Baum* 221; shrub 1–1·4 m. high. Here and there in short shrub-grown pasturage at Cambambe, Cuebe, 18 April 1906, *Gossweiler* 2627 (Brit. Mus. Herb.); stems numerous, densely branched; bark red-brown; leaves soft, equally green on both faces; flowers bright vine-red with white longitudinal markings outside; segments spreading, white inside; stamens white; stigmas 3, white; fruit ovate elliptic, lurid green with purplish shades. Common in the T'Chanas from Cuebe to Quembo, Luassingua, 19 June 1906,

---

* Continued from *K.B.* 1932, 100.

Gossweiler 2732 (Brit. Mus. Herb.); a suffruticose herb of vine red coloration and white flowers. Here and there in open thickets at Cassuango, Cuiriri, March 1906, *Gossweiler* 3708 (Brit. Mus. Herb.); flowers white and rose coloured.

Gnidia clutyoides *E. A. Bruce*, sp. nov. [Thymelaeaceae]; affinis *G. Oliverianae* Engl. sed bracteis lanceolatis vel anguste ovatis apice acutis, tubo calycis minus dense pubescente differt.

Herba perennis, erecta, glabra, 15–25 cm. alta, radice lignosa, caulibus florentibus multis simplicibus vel raro infra apicem ramosis. *Folia* subsessilia, linearia usque lineari-lanceolata, glabra, uninervia, circiter 1 cm. longa, usque ad 1·5 mm. lata, apice acuta vel subacuta. *Capitula* terminalia, circiter 10–20-flora. *Involucri bracteae* 5–8, lanceolatae vel anguste ovatae, chartaceae, glabrae, nervis mediis prominentibus, circiter 8 mm. longae, 2·5 mm. latae, apice acutae vel subacutae. *Calycis tubus* sericeo-pubescens, infra articulum densior; tubus superior circiter 9 mm. longus, inferior circiter 4 mm. longus, lobis circiter 2 mm. longis obovatis apice rotundatis vel leviter emarginatis extra sericeo-pubescentibus intra glabris. *Petala* 4, minuta. *Ovarium* glabrum.

TANGANYIKA TERRITORY: Karagwe, near Ruvuru river, 4000–5000 ft., on dry hills, *Scott Elliot* 8128 (type), 8131; Bukoba District, Ndama, about 3900 ft., *A. E. Haarer* 2264.

Acacia (Vulgares-Ataxacanthae) chariessa *Milne-Redhead*, sp. nov. [Mimosaceae]; ab *A. Lugardae* N. E. Br. foliis minoribus, spicis axillaribus brevioribus longius pedunculatis paucifloris differt.

Dumus concinnus, deciduus, fere glaber. *Rami* tenues, spinis sparsis parvis recurvis armati, purpureo-brunnei vel plus minusve glaucescentes; spinae stipulares nullae. *Folia* bipinnata, usque 3·5 cm. longa, 2·5 cm. lata; petioli usque ad 1 cm. longi, glandula sessili supra medium instructi; rhachides primarii usque ad 2·5 cm. longi, superne leviter sulcati, inconspicue et minute glanduloso-pubescentes, inferne sparsim minute aculeati; pinnae 3–8-jugae; rhachides pinnarum usque ad 12 mm. longi; foliola 16–26-juga, lineari-oblonga, apice rotundata, basi inaequilateralia, circiter 3 mm. longa, 0·7 mm. lata, costa leviter laterali, valde inconspicua. *Spicae* solitariae, axillares, folia aequantes vel superantes; pedunculi usque 2 cm. longi, rarissime minute aculeati; spicae usque ad 2 cm. longae, circiter 1 cm. diametro, 15–30-florae. *Flores* sessiles, ochroleuci vel fere albi. *Calyx* campanulatus, 5-dentatus, dentibus obtusis vel subacutis 0·5 mm. longis, circiter 2·5 mm. longus. *Petala* libera vel leviter coalita, oblongo-lanceolata, acuta, circiter 3 mm. longa. *Stamina* filiformia, circiter 6 mm. longa, antheris minutis. *Ovarium* glabrum, oblongum, stipitatum (stipite 1 mm. longo), circiter 1 mm. longum; stylus filiformis, circiter 5 mm. longus. *Legumen* rectum, planum, lineari-oblongum, stipitatum, apice conspicue rostratum, in toto usque ad 7 cm. longum, 1·3 cm. latum, margine plus minusve undulatum, purpureo-brunneum, seminibus 1–5.

SOUTHERN RHODESIA: Bulawayo District: Bulawayo, altitude about 4400 feet, 9 Dec. 1920, *Borle* 13 (type); a common bush with scented white flowers. Bulawayo, in the veldt, flowering during the wet season, Dec. 1904, *Gardner* 89. Bulawayo, altitude about 4465 ft., in fruit, 18 Feb. 1912, *Rogers* 5741. Bulawayo, July 1898, *Rand* 450 (Brit. Mus. Herb.). Nahla, Dec. 1923, *Steedman* 61; a graceful, feathery bush with epidermal thorns and spikes of pale yellow flowers, rare here, but abundant round Bulawayo; did not see fruit. Victoria District: Victoria, without date, *Monro* 2170 (Brit. Mus. Herb.).

Albizzia (Eualbizzia-Microphyllae) struthiophylla *Milne-Redhead*, sp. nov. [Mimosaceae]; ab *A. Harveyi* Fourn. pinnis valde numerosis, pedunculis ebracteatis, foliolis obtusis rectis differt.

Arbor parva, circiter 6 m. alta, decidua, ramis diffusis. *Ramuli* vetustiores glabri vel puberuli; ramuli novelli dense flavo-tomentosi. *Folia* gracilia, usque ad 23 cm. longa, 5 cm. lata; petioli 2·5 cm. longi, tomentosi, glandulis inconspicuis supra petiolos haud multum elevatis vix 2 cm. a basi ortis; foliorum rhachides 20 cm. longi, ultra pinnas terminales breviter prolati, tomentosi, apicem versus inter pinnas glandulosi; pinnae suboppositae, 25–45-jugae; pinnarum rhachides 5 cm. longi, ultra foliola terminalia prolati, tomentosi; foliola 25–45-juga, sessilia, oblonga, recta, apice rotundata, basi obliqua, inaequilateralia, 4 mm. longa, 1 mm. lata, subtus glabra vel parcissime puberula, supra glabra, margine flavo-hirsuta; costae mediae plus minusve sulcatae; nervi laterales inconspicui; stipulae caducae, lineari-subulatae, 4 mm. longae, extra dense flavo-tomentosae, intus glabrae. *Inflorescentiae* 1–3 ex axillis foliorum ortae, capitatae; pedunculi 3·5 cm. longi, flavo-tomentosi, ebracteati; capitula globosa, circiter 35-flora, bracteis minutissimis flores subtendentibus; flores plerique hermaphroditi, tantum duo flores ad apicem capitulorum siti masculi. *Flores* ☿ breviter pedicellati:—*Calyx* campanulatus, brevissime lobatus, 3 mm. altus, lobis obtusis 0·2 mm. longis 0·8 mm. latis breviter flavo-hirsutis. *Corolla* ochroleuca, infundibuliformis, 6 mm. longa, parce flavo-hirsuta, fere ad medium lobata, lobis ovato-lanceolatis sub-acutis ad apicem densius flavo-hirsutis. *Stamina* ochroleuca, numerosa, glabra, basin versus in tubum 2–3 mm. longum vix 1 mm. latum connata, 20 mm. longa, filiformia, antheris minutis. *Ovarium* glabrum, 2 mm. longum, stylo filiformi 17 mm. longo. *Flores* ♂ sessilia:—*Calyx* late infundibuliformis, 3 mm. altus, profunde lobatus, lobis late ovatis obtusis 2·5 mm. longis 2·5 mm. latis breviter flavo-hirsutis. *Corolla* ochroleuca, infundibuliformis, 7 mm. longa, parce flavo-hirsuta, fere ad medium lobata, lobis lanceolato-acutis ad apicem densius flavo-hirsutis. *Stamina* pallide rosea, numerosa, glabra, medium versus in tubum 10 mm. longum 3 mm. diametro connata, 20 mm. longa, filiformia, antheris minutis. *Ovarium* ad discum redactum. *Legumen* late-lineare, rectum, plano-compressum, undulatum, 16 cm. longum, 3·5 cm. latum, dehiscens.

NORTHERN RHODESIA: Mazabuka District: in *Acacia* grassland at Mazabuka, 6 Oct. 1930, *Milne-Redhead* 1207 (type); small tree, 6 m. high; young leaves and flowers obtained, flowers in creamy white globular heads; most flowers hermaphrodite, two male flowers in each head; male flowers larger with a longer staminal tube which is pinkish; last season's fruits still on the tree. Pemba, 30 Oct. 1911, *Rogers* 8926. Chilanga District: Quein Sabe, 8 Oct. 1929, *Mrs. Sandwith* 35; a tree with white flowers. The Argosy Copper Mine, Quien Sabe, 11 Oct. 1929, *Mrs. Sandwith* 48.

SOUTHERN RHODESIA: Lomagundi District: 1080 m. altitude, without exact locality, Oct. 1930, *Eyles* 3793. Hartley District: without precise locality, in fruit, June 1930, *Jack* s.n. (*Govt. Herb. Salisbury* 5072). Bulawayo District: Bulawayo, on schist about 4469 ft. altitude, Oct. 1902, *Eyles* 1090 (Brit. Mus. Herb.); a large tree with yellow flowers. Bulawayo, Nov. 1908, *Chubb* 386 (Brit. Mus. Herb.). Victoria District: Victoria, 1909, *Monro* 558 (Brit. Mus. Herb.).

Ceropegia filicalyx *Bullock*, sp. nov. [Asclepiadaceae]; *C abyssinicae* Decne. affinis sed calyce duplo longiore, corollae lobis minoribus, indumento densiore, habitu majore differt.

Herba erecta usque ad 1 m. alta, caulibus simplicibus patente hirsutis. *Folia* anguste oblonga vel oblanceolato-oblonga, apice subacuta vel obtusa, basi gradatim angustata, 6–12 cm. longa, 1–2 cm. lata, supra subadpresso-pilosa, infra satis dense patente pilosa, nervis lateralibus utrinsecus circiter 7, petiolis usque ad 1 cm. longis. *Flores* in axillis 3–5, fasciculati, pedicellis gracilibus usque ad 2 cm. longis patente villoso-hirsutis. *Calyx* fere ad basin 5-lobatus, lobis filiformibus 1 cm. longis hirsutis. *Corolla* 2·3 cm. longa, lobis 6 mm. longis apice cohaerentibus, tubo 1·7 cm. longo medio 5 mm. diametro, coronae lobis 2 mm. longis, supra antheras in appendicibus crassis linearibus apice cohaerentibus 1·5 mm. longis productis. *Fructus* non visi.

TANGANYIKA TERRITORY: Kikori, 4200 ft., a very local erect herb about 3 ft. high, growing in *Acacia usambarensis* woodland, 14 May 1930, *B. D. Burtt* 2755 (type); Moshi, about 3000 ft., June 1928, *Haarer* 1493.

This interesting plant is very closely allied to *C. abyssinica* Decne., and as in that species the otherwise brownish-purple corolla has a broad cream-coloured band encircling the tube, this colour being repeated on the backs of the corolla-lobes. *C. filicalyx* is also very near to *C. Bequaertii* De Wild., a plant from the Belgian Congo, and known to me only from the description.

Huernia Verekeri *Stent*, sp. nov. [Asclepiadaceae]; forma coronae aspectu *Duvaliae* sed dentibus inter lobos corollae *Huerniae* valde distincta.

Caules circiter 3·5–5 cm. alti, glabri, 5–7-angulati, dentibus usque ad 8 mm. longis tenuiter acuminatis e basi deltoidis. *Flores* e basi caulis 1–3-fasciculati, pedicellis 8 mm. longis glabris viridibus.

Calycis lobi ovati, acuminati, in cuspidem longam tenuem angustati, circiter 7 mm. longi, glabri. *Corolla* tubo vadoso cupuliformi 4 mm. alto et 9 mm. diametro, inter lobos dente parvo reflexo instructa, lobis horizontaliter patentibus 7 mm. longis, pallide flavo-viridibus setis purpureis minutis indutis, tubo basi albo apicem versus fere rubro glabro praeter setas circum apicem. *Corona* exterior alba, crassa, disciformis, interior lobis antheris incumbentibus, quam antheris brevioribus, crista dorsali late rotundata plana satis magna albida vel roseo leviter suffusa ornata.

SOUTHERN RHODESIA: Sabi Valley, *L. A. Vereker*; flowering in Mr. Basil Christian's garden at Ewanrigg, Salisbury, *Govt. Herb. Salisbury* 5427 (type).

Pentas graniticola *E. A. Bruce*, sp. nov. [Rubiaceae]; affinis *P. longitubae* K. Schum. sed glabra et minor.

Suffrutex glaber, ramis basi crassis succulentis. *Folia* lanceolata vel ovato-lanceolata, utrinque glabra, 7–13 cm. longa, 1–4 cm. lata, apice acuminata, basi anguste cuneata, nervis lateralibus utrinsecus circiter 10, petiolis anguste alatis usque ad 1 cm. longis. *Stipulae* 6-laciniatae, lacinis subulatis circiter 1·5 cm. longis. *Inflorescentia* cymosa, terminalis, glabra, floribus breviter pedicellatis. *Calyx* glaber, tubo campanulato circiter 5 mm. longo, lobis 5 linearibus persistentibus usque ad 2 cm. longis. *Corolla* glabra, 5-lobata, lobis oblongo-lanceolatis circiter 1 cm. longis, tubo anguste cylindrico apice dilatato usque ad 9 cm. longo, staminibus et stylo inclusis. *Fructus* anguste ovoideus, glaber, 10-costatus, calycis lobis persistentibus.

TANGANYIKA TERRITORY: Coast of Speke Gulf, Lake Victoria, near Mwanza, 3740 ft.; a semi-succulent plant with long, white, tubular, jasmine-scented flowers growing in the cracks of granite rocks, *B. D. Burtt* 2497 (type). Shinyanga District, in the Mantini Hills, 4000 ft.; a white, tubular, sweet-scented flowered plant, the base of the stem succulent and swollen; growing on exposed hill-tops in the cracks of great granite rocks, *B. D. Burtt* 2458.

Canthium Burttii *Bullock*, sp. nov. [Rubiaceae]; *C. lactescenti* Hiern affine sed ramulis novellis pubescentibus, foliis minoribus utrinque dense pubescentibus, floribus majoribus minus numerosis differt.

Arbor vel plerumque *frutex* usque ad 6·5 m. altus; caules maturi glabri, crassi, cortice primum saturate purpurei, demum pallide cinerea; ramuli juniores graciles, subtetragoni, dense patulo-pubescentes, apice bifoliati, usque ad 5·5 cm. longi vel saepe breviores. *Stipulae* persistentes, triangulares, apice acutissimae, usque ad 1·3 cm. longae et 1 cm. latae, marginibus membranaceae, extra demum subglabrae. *Folia* opposita, elliptica vel ovata usque fere rotundata, apice breviter et abrupte acuminata vel acuta, basi acuta vel cuneata, 3·5–5·5 cm. longa, 2·5–3 cm. lata, utraque dense velutino-pubescentia, nervis lateralibus valde adscendentibus utrinque circiter 5. *Cymae* ex axillis foliorum annotinorum delapsorum orti; pedunculi velutino-pubescentes, circiter 1–1·5 cm. longi, floribus apice dense glomeratis; pedicelli graciles, glabrescentes, 1–3 mm. longi; bracteae non visae. *Calyx* truncatus vel undulatus, limbo minutissimo vel fere obsoleto, glaber. *Corolla* pallide luteo-viridis, tubo cylindrico 2 mm. longo, lobis 5 ovatis subacutis 2·5 mm. longis patentibus, alabastro apice rotundata. *Stamina* 5; antherae ellipticae, 1·75 mm. longae; filamenta brevissima, filiformia. *Ovarium* turbinatum, glabrum, 1 mm. longum; stylus 2·5 mm. longus, basin versus adpresse pubescens, stigmate cylindrico 0·75 mm. longo sulcato. *Fructus* non visi.

TANGANYIKA TERRITORY: Manyoni Copje, among granite rocks, 4100 ft., a spreading tree, or usually a shrub, up to 20 ft. high, with pale yellowish-green flowers, 13 Dec. 1931, *B. D. Burtt* 3542.

Although closely allied to *Canthium lactescens* Hiern, this is at once distinguished by the velvety leaves and young branchlets, and the less numerous flowers which form an almost globose cyme at the apex of the peduncle. The growth form is interesting. When the terminal bud opens at the commencement of each growth-season, the main axis is continued, and terminates in two leaves and a terminal bud; at the base two lateral and smaller, though otherwise similar, shoots arise, while at practically the same level, in a plane at right angles, the peduncles are borne. Presumably, the cymes actually arise from the axils of the fallen leaves of the previous year, while the lateral branchlets arise from buds in the axils of scale leaves of the terminal bud. Occasionally three lateral shoots arise, but there are never more than two cymes. In the case of lateral buds, delayed development is indicated. From each opposite lateral bud one cyme and one branchlet arise, so that if the intervening internodes were removed, the branchlets and cymes would appear exactly as though produced from a terminal bud. The latter occasionally remains undeveloped, a few flowers being produced instead; this condition, however, is abnormal.

Tapiphyllum Fadogia *Bullock*, sp, nov. [Rubiaceae-Vanguerieae]; *T. confertifloro* Robyns valde affine sed foliis ternatis, floribus congestis multo numerosioribus, bracteis minoribus ternatis facile distinguitur.

Caules herbacei, medullosi, erecti, dense fulvo-tomentosi, internodiis usque ad 8·5 cm. longis. *Stipulae* subtriangulares, vaginatim connatae, intus villosae, usque ad 4 mm. longae, in caudam subulatam usque ad 8 mm. longam desinentes. *Folia* ternata, elliptica, apice abrupte et breviter acuminata, basi rotundata, 7–8 cm. longa, 4·5–5·5 cm. lata, supra densissime pubescentia, subtus flavescenti-tomentosa, nervis lateralibus subtus prominentibus utrinsecus 6–8; petioli 5 mm. longi. *Flores* subsessiles, in cymas tomentosas axillares multifloras congesti, basi bracteis 3 linearibus leviter inaequalibus instructi, pedunculis 10–12 mm. longis. *Calyx* usque ad 6-lobatus, lobis linearibus plerumque leviter inaequalibus 3–5 mm.

longis, tubo 2·5 mm. longo. *Corolla* extra dense tomentosa, alabastro apiculo 2 mm. longo praedita, 5-lobata, lobis intus glabris circiter 5 mm. longis, tubo 5 mm. longo intus pilis reflexis annulato. *Antherae* parvae, subexsertae, subsessiles. *Stylus* 7 mm. longus; stigma exsertum, 1 mm. longum, coroniforme, sulcatum. *Fructus* non visi.

TANGANYIKA TERRITORY: Muhutive, Bukoba District, about 4000 ft., June 1931, *A. E. Haarer* 2033.

The writer is much indebted to Dr. W. Roybns, of Brussels, who very kindly examined this plant, and declared it to be a species unknown to him. The verticillate leaves give it some resemblance to the allied genus *Fadogia*.

Tapiphyllum grandiflorum *Bullock*, sp. nov. [Rubiaceae-Vanguerieae]; *T. confertifloro* Robyns affine sed foliis majoribus basi cordatis, pedunculis multo brevioribus, floribus majoribus differt.

Caules herbacei, medullosi, erecti, cylindrici, sed superne plus minusve compressi, flavescenti-tomentosi, internodiis circiter 7 cm. longis. *Folia* opposita, ovata vel oblongo-ovata, apice subacuta, vix acuminata, basi cordata, 7–9 cm. longa, 4·5–5·5 cm. lata, supra dense pubescentia, subtus flavescenti-tomentosa, nervis lateralibus utrinsecus circiter 6; petioli usque ad 5 mm. longi. *Flores* in cymas tomentosas simplices axillares 5–8-floras dispositi, basi bracteis duabus linearibus instructi, pedunculis usque ad 5 mm. longis. *Calyx* 5-lobatus, lobis saepe inaequalibus late linearibus circiter 5–8 mm. longis, tubo 5 mm. longo. *Corolla* extra dense tomentosa, albastro apiculo 2 mm. longo praedita, 5-lobata, lobis intus glabris circiter 6 mm. longis, tubo 6 mm. longo et 4 mm. diametro, intus pilis reflexis annulato. *Antherae* exsertae, 1 mm. longae, subsessiles. *Stylus* 8 mm. longus; stigma exsertum, coroniforme, profunde sulcatus, fere 2 mm. longum. *Fructus* non visi.

NORTHERN RHODESIA: Mumbwa, *Mrs. Macaulay* 922.

The very broad corolla-tube and large cordate leaves of this species render it strikingly different in general appearance from its ally, *T. confertiflorum* Robyns.

Lagynias littoralis *Bullock et Greenway*, sp. nov. [Rubiaceae]; *L. pallidiflorae* Bullock affinis sed floribus foliisque multo majoribus valde distincta.

Arbor glabra, circiter 8 m. alta, ramulis teretibus cortice pallide griseo. *Folia* leviter discoloria, oblonga usque anguste oblongo-elliptica, apice late obtusiuscule subacuminata, basi acuta, 8–12 cm. longa, 3–5 cm. lata, petiolis 9–12 mm. longis; stipulae mox deciduae, longe subulatae, basi latae, parte subulata circiter 1 cm. longa. *Cymae* axillares, brevissime pedunculatae, circiter 4–6-florae, pedunculis 2–3 mm. longis, pedicellis 1·5–2·5 cm. longis. *Calyx* persistens, usque ad receptaculum 5-lobatus, lobis oblongo-spathulatis obtusis 1·3 mm. longis; receptaculum subglobosum, 2·5 mm.

diametro. *Corolla* mox decidua, non visa. *Ovarium* 5-loculare, loculis 1-ovulatis. *Drupa* abortu bi- vel unilocularis, calyce non accrescente coronata, loculis ellipsoideis 1·5 cm. longis 1 cm. latis.

PEMBA ISLAND: Ngezi Forest, in dense shade; a very common tree up to 25 ft. high, with greenish-white flowers, 11 Dec. 1930, *P. J. Greenway* 2697 (type).

KENYA COLONY: Kwale; *sub R. M. Graham* 1691 *in Herb. Kew.*

In an observation following the description of *Lagynias pallidiflora* Bullock in Kew Bull. 1931, 273, the Kwale specimen cited above is mentioned as being probably a new species of the genus. The collector on his label describes it as a "large forest climber," a hundred feet in height, and four inches in diameter towards the base. There seems to be no doubt that the label refers to another plant, since the specimen is certainly conspecific with the Pemba plant which has been made the type of this species.

Helichrysum acrobates *Bullock*, sp. nov. [Compositae]; *H. abyssinico* Sch. Bip. affine sed foliis brevioribus latioribus, indumento breviore adpressiore, capitulis majoribus differt; ab *H. trilineato* DC., cui maxime affine, indumento densiore, capitulis majoribus, inflorescentia densiore recedit.

Fruticulus ambitu orbiculari usque ad 2 dm. altus, dense foliatus, dense adpresse albo-lanato-tomentosus. *Folia* subspatulato-oblonga, minute mucronata, inferiora usque ad 1·5 cm. longa et 3–5 mm. lata, superiora minora, e basi amplexicauli 3-nervia. *Rami floriferi* dense foliati, non ramosi; capitula numerosa in corymbas densas usque ad 3 cm. diametro disposita. *Capitulum* late campanulatum, circiter 5–7 mm. diametro; bracteae involucri aureo-luteae, multiseriatae, lanceolatae, acutae, usque ad 5 mm. longae, membranaceae. *Flores hermaphroditi* circiter 70–80. *Pappi setae* 8–10, minute barbellatae. *Achaenia* breviter pubescentia.

TANGANYIKA TERRITORY: Summit of Hanang Mt. (Guruwe Mt.), Mbulu District, 11,182 ft., growing in tufts among the rocks, with yellow flowers, 26 Dec. 1929, *B. D. Burtt* 2279.

This species belongs to the section *Chrysantha*, subgenus *Euhelichrysum*.* It differs from *H. abyssinicum* in its shorter, more closely adpressed indumentum and larger capitula. The leaves are also much broader and shorter than in that species.

Pulicaria attenuata *Hutch. et B. L. Burtt*, sp. nov. [Compositae]; foliis spatulato-oblanceolatis ad basin longe attenuatis ubique glandulosis et breviter molliter pubescentibus distincta.

Herba usque ad 30 cm. alta, ubique glandulosa et breviter molliter pubescens; caulis ramique costati. *Folia* spatulato-oblanceolata, ad basin longe attenuata, apice subacuta, 4–5 cm. longa circiter 1 cm. lata, nervis lateralibus circiter 3, superne leviter dentata. *Capitula* pedunculata, late campanulata, circiter 1 cm.

---

* Moeser, "Die Afrikanischer Arten der Gattung Helichrysum," in Engl. Bot. Jahrb. xliii., 420-460 (1909), et *op. cit.* xliv. 239-345 (1910).

diametro ; pedunculi saepe circiter 5 cm. interdum usque ad 12 cm. longi, paucibracteati. *Involucri bracteae* circiter 3-seriatae, lineares, 6–7 mm. longae, extra dense pubescentes. *Flores* radii flavi, tubo pubescente et ligula brevi apice denticulata, *Flores* disci numerosi. *Achaenia* costata, adpresse pubescentia. *Pappus* duplex, serie exteriore cupulata, profunde incisa, interiore setosa, setis albidis circiter 10 corollae aequilongis minute barbellatis.

EASTERN SUDAN : Darfur ; Malha, Jebel Meidob, in clay soil, strongly aromatic, Sept. 1930, *A. P. G. Michelmore.*

Guizotia oblonga (*Hutch.*) *Hutch. et Bullock*, comb. nov. [Compositae] ; *Wedelia oblonga* Hutch. in Gard. Chron. Ser. 3, xlv. 18 (1909).

A large number of specimens of this species, from Kenya Colony and Uganda, are now preserved in the Kew Herbarium. It was originally described from a plant raised from seed collected by Diespecker in Kenya Colony by Messrs. J. Veitch & Son in this country, and from a specimen collected by Whyte in the Eldama Ravine. It may be noted that the *Index Kewensis* reference to the original description is wrong, and should be as above instead of " Kew Bull. 1909, 18."

Tinnea Physalis *E. A. Bruce*, sp. nov. [Labiatae] ; affinis *T. vesiculosae* Gürke sed foliis crenatis, bracteis majoribus differt.

Frutex usque ad 1·3 m. altus, ramis quadrangularibus pubescentibus. *Folia* opposita, longe petiolata, ovata, acuminata, basi late cuneata, margine crenato ; laminae 4–7 cm. longae, 2–4 cm. latae, infra valde supra leviter pubescentes, utrinque dense glandulosae, nervis lateralibus utrinsecus circiter 4, petiolis usque ad 2 cm. longis dense pubescentibus. *Inflorescentia* terminalis. *Flores* graciliter pedicellati, in axillis bractearum majorum dispositi. *Bracteae* foliaceae obovatae vel oblanceolatae, apice longe acuminatae, basi cuneatae, leviter pubescentes et glandulosae, circiter 2·5 cm. longae. *Calyx* bilabiatus, pubescens et glandulosus, oblongus, circiter 1·5 cm. longus, valde accrescens, in fructu circiter 3·5 cm. longus, 2 cm. latus, vesiculosus, membranaceus, basi cordatus, labiis brevibus rotundatis, nervis longitudinalibus circiter 14. *Corolla* pubescens in calyce inclusa.

TANGANYIKA TERRITORY : Shinyanga District ; Mantini Hills, 4000 ft. ; a loosely branched shrub up to 4 ft. high, growing on the summit of granite hills in the shade of *Commiphora kyimbelensis*, frequent locally, *B. D. Burtt* 2501 (type).

Carex Mannii *E. A. Bruce*, sp. nov. [Cyperaceae] ; affinis *C. Boryanae* Schkuhr sed spiculis brevioribus, foliis rigidis basi purpureis, glumis abrupte acuminatis differt.

Rhizoma caespitosum. *Culmus* circiter 80 cm. altus. *Folia* culmum subaequalia, 4–6 mm. lata, rigida, basi purpurea. *Inflorescentia* anguste paniculata, circiter 20 cm. longa, interrupta. *Spiculae*

circiter 9, elongato-cylindricae, circiter 5 cm. longae, densiflorae, terminales mere ♂ vel basi breviter ♀, caeterae plerumque ♀, vel apice pauce ♂, inaequaliter pedunculatae, pedunculis scabris. *Rhachis* scabra. *Bracteae* foliaceae. *Glumae* lanceolatae, abrupte acuminatae, apiculatae, rubro-purpureae, media nerva viride. *Utriculi* squamis longiores, anguste ovoidei, circiter 5 mm. longi, rostris circiter 2 mm. longis. *C. Boryana* var. *minor* Boott. Illustr. iii. 111 (1862), partim, quoad t. 348. *C. Boryana* C. B. Cl. in Dyer, Fl. Trop. Afr. viii. 523 (1902), non Schkuhr. *C. Boryana* var. *simplicissima* Kükenth. in Engl. Pflanzenr. Cyperac.-Caricoid. 651 (1909), partim.

FERNANDO PO: Clarence Peak, 7500 ft., *Mann* 1478 (type); 8500 ft. *Mann* 661.

CAMEROONS MOUNTAIN: Ukele Camp, 6000 ft., in open part of forest and in grassland, *Maitland* 1341.

UGANDA: Ruwenzori, over 10,000 ft., in short bush, May, *Scott Elliot* 7873.

XVI—SILENE CUCUBALUS: THE CORRECT NAME OF THE BLADDER-CAMPION.

T. A. SPRAGUE AND M. L. GREEN.

The case of the Bladder-campion has long been regarded as one of the most difficult in the realm of nomenclature. Six different names have been adopted for it by experienced botanists during the last twenty-five years, mainly owing to differences in the interpretation of the International Rules of Nomenclature. These names are *Silene Cucubalus* Wibel, *S. inflata* (Salisb.) Sm., *S. venosa* (Gilib.) Aschers., *S. vulgaris* (Moench) Garcke, *S. latifolia* (Mill.) Britt. et Rendle, *S. angustifolia* (Mill.) Briq. The difficulties experienced in this connection related chiefly to nomina abortiva (illegitimate names), that is, names formed in contravention of the International Rules, and to the use of later homonyms. Two views prevailed as to the latter, some botanists considering that a later homonym could be adopted if the earlier homonym was rejected on *taxonomic* grounds, and others that it could be adopted only if the earlier homonym was *nomenclaturally* invalid.

At the International Botanical Congress held at Cambridge in 1930, certain alterations were made in the Rules, perhaps the most important being the rejection of all later homonyms of validly published names. Names that appeared only as nomina nuda are of course not validly published, and have no status under the Rules, but illegitimate names that are validly published must not be duplicated. It may be explained parenthetically that there are two essentials for " valid publication " of a name: (1) effective circulation, for example, by printing and placing on sale to the general public; (2) the provision of a description or a reference to a former description under another name. Hence the apparent paradox that an illegitimate name can be " validly published."

Under the new Rules there is no doubt that *Silene Cucubalus* Wibel is the correct name for the Bladder-campion. The detailed synonymy of the species is given below in chronological order.

SYNONYMY OF THE BLADDER-CAMPION.

Square brackets enclosing an author's name indicate that the trivial as originally proposed by that author was illegitimate.

1. *Cucubalus Behen* L. Sp. Pl. ed. 1, 414 (1753).
2. *Cucubalus latifolius* Mill. Gard. Dict. ed. 8, no. 2 (1768).
3. *Cucubalus angustifolius* Mill. l.c. no. 3.
4. *Lychnis Behen* (L.) Scop. Fl. Carn. ed. 2, i. 305 (1772).
5. *Cucubalus venosus* Gilib. Fl. Litvan. Collect. v. 165 (1782).
6. *Behen vulgaris* Moench, Meth. 709 (1794).
7. *Cucubalus inflatus* Salisb. Prodr. 302 (1796).
8. *Silene Cucubalus* Wibel, Prim. Fl. Werth. 241 (1799).
9. *Silene inflata* [Salisb.] Sm. Brit. Bot. 467 (1800).
10. *Viscago Behen* (L.) Hornem. Hort. Hafn. 409 (1813).
11. *Silene vesicaria* Schrad. ex Reichb. Fl. Germ. Excurs. 823 (1832).
12. *Silene Behen* (L.) Wirzen, Enum. Pl. Offic. Fenn. 36 (1837), non L. (1753).
13. *Silene crispata* Stev. in Bull. Soc. Nat. Mosc. xxix. pt. 1, 315 (1856), in textu.
14. *Silene Wallichiana* Klotzsch in Klotzsch & Garcke, Bot. Ergebn. Waldem. Reise, 139 (1862).
15. *Silene venosa* [Gilib.] Aschers. Fl. Brandenb. i. 86 (1864).
16. *Oncerum globosum* Dulac, Fl. Hautes-Pyr. 258 (1867).
17. *Behen vesicarius* [Schrad.] Fourr. in Ann. Soc. Linn. Lyon, n.s. xvi. 343 (1868).
18. *Silene vulgaris* [Moench] Garcke, Fl. Deutschland, ed. 9, 64 (1869).
19. *Behenantha inflata* [Salisb.] Schur in Verh. Nat. Ver. Bruenn, 1876, xv. pt. 2, 131 (1877).
20. *Silene pseudo-Behen* Schur ex Nyman, Consp. 88 (1878).
21. *Silene latifolia* (Mill.) Britt. et Rendle, List Brit. Seed Plants and Ferns, 5 (1907), non Poir. (1789).
22. *Silene angustifolia* (Mill.) Briq. Prodr. Fl. Corse, 543 (1910), non Poir. (1789).

ANALYSIS OF THE SYNONYMY.

One of the basic provisions of the International Rules is that each species must bear the *earliest* validly published legitimate epithet available under the particular generic name. All that is necessary, therefore, is to consider each name in chronological order, and to ascertain whether it was both validly published and legitimate, and if so, whether the specific epithet can be employed for the species under the generic name adopted—in this case *Silene*.

Nos. 1, 4, 10, 12. The earliest specific epithet, *Behen*, cannot be adopted under *Silene*, as the resulting combination *S. Behen* (L.) Wirzen (1837) is a later homonym of *S. Behen* L. (1753).

Nos. 2, 3, 21, 22. The epithets *latifolius* and *angustifolius* cannot now be used under *Silene*, since the resulting combinations *S. latifolia* (Mill.) Britt. et Rendle (1907), and *S. angustifolia* (Mill.) Briq. (1910) are later homonyms of the validly published names *S. latifolia* Poir. (1789) and *S. angustifolia* Poir. (1789) respectively.

Nos. 5, 15. *Cucubalus venosus* Gilib. (1782) is illegitimate, being a superfluous name for *C. Behen* L. (1753). The date of an epithet for purposes of priority is that of its valid publication as a *legitimate* epithet. The epithet *venosus* therefore does not possess priority from 1782. *Silene venosa* Aschers. (1864) is accordingly treated under the Rules, not as a new *combination*, but as a new *name* for purposes of priority. It is superfluous, being a later name for *S. Cucubalus* Wibel (1799).

Nos. 6, 18. *Behen vulgaris* Moench (1794) is an illegitimate name. It is true that Moench could not adopt the earliest epithet *Behen*, because that would have resulted in the creation of a tautonym, but he included *Cucubalus latifolius* Mill. in the species, and should therefore have adopted the epithet *latifolius* under the generic name *Behen*. As in the preceding case, the epithet *vulgaris* did not acquire priority by its appearance in an illegitimate combination. *Silene vulgaris* Garcke (1869) is accordingly a superfluous name for *S. Cucubalus* Wibel (1799).

Nos. 7, 9, 19. *Cucubalus inflatus* Salisb. (1796) is illegitimate, being a superfluous name for *C. Behen* L. (1753) : Salisbury arbitrarily changed the name because he did not like generic names being used as specific epithets. Here again, the epithet, *inflatus*, gained no priority by its publication as part of an illegitimate name. *S. inflata* Sm. (1800) is accordingly a superfluous name for *S. Cucubalus* Wibel (1799).

In 1799, when Wibel transferred the species to *Silene*, there were three legitimate epithets for it (all under *Cucubalus*), namely, *Behen*, *latifolius* and *angustifolius*, and three epithets which had appeared in illegitimate combinations, namely *venosus*, *vulgaris* and *inflatus*. As shown above, the adoption by Wibel of any of the three legitimate epithets would have resulted in the creation of a later homonym. He was therefore free, either to propose a new specific epithet, or to adopt one of the three which had previously appeared in illegitimate combinations. He chose the new name *Silene Cucubalus*, and this is therefore the correct name (under *Silene*) according to the International Rules.

Nos. 11, 17, 20. *Silene vesicaria* Schrad. ex Reichb. (1832) and *S. pseudobehen* Schur ex Nyman (1878) were not validly published, since they appeared only in synonymy.

No. 13. *Silene crispata* Stev. (1856) was a legitimate name for a new species distinguished by Steven from *S. inflata* (*S. Cucubalus*). If treated as conspecific with the latter, it falls into synonymy.

No. 14. *Silene Wallichiana* Klotzsch (1862) was also published as a new species. The same remarks apply.

No. 16. *Oncerum globosum* Dulac (1867) was published as a new name for *Silene inflata* Sm., and was therefore illegitimate, being superfluous.

It is highly satisfactory that the revision of the International Rules at Cambridge in 1930 has made it possible to determine with certainty the correct name in such a complicated and formerly controversial case.

XVII—THE HISTORY OF NOTHOPANAX.

T. A. Sprague and M. L. Green.

The generic name *Nothopanax* (Araliaceae) was proposed in 1855 by Miquel (Fl. Ind. Bat. i. pt. 1, 765) for a group of shrubby species from southern Asia, Oceania and New Zealand. Of these he mentioned only five species from the Dutch East Indies, since the genus was published in his flora of that area. The Oceanic and New Zealand species being unspecified, the type of the name *Nothopanax* is to be sought among the five Asiatic species actually mentioned by Miquel as belonging to the genus. Four of these, namely *N. fruticosum* (L.) Miq., *N. obtusum* (Bl.) Miq., *N. pinnatum* (Lam.) Miq. and *N. Anisum* (DC.) Miq. were referred to *Polyscias* Forster (1776) by Harms (Engl. u. Prantl, Pflanzenfam. iii. Abt. 8, 45 : 1894). The fifth, *N. cochleatum* (Lam.) Miq., which Harms had not seen, was retained by him under *Nothopanax*, in which he included also nine species from New Zealand and one each from Tasmania, Tahiti and China (l.c. 48).

Apparently the only material difference between *Polyscias* and *Nothopanax* (*sensu* Harms) is that the leaves of the former are *pinnate* (simply pinnate, bipinnate or tripinnate), whilst those of the latter are *digitate* or *simple*. The ovary of *Polyscias* is 2–10-locular, and that of *Nothopanax* is 2–4-locular, according to Harms (ll. cc.). *N. cochleatum* (Lam.) Miq. has simple or trifoliolate leaves, and a 3–5-merous gynoecium, according to the figures given by Koorders and Valeton (Atlas Baumart. Java, t. 697 : 1916). On the leaf characters, *N. cochleatum* therefore falls under *Nothopanax* Miq. emend. Harms. The number of loculi does not seem to possess much significance.

The correct application of the name *Nothopanax* Miq. now remains to be considered. It is clear from Miquel's description (l.c.) that he regarded his genus as one natural group with a wide range of characters as regards the leaves, and in which no one element was more typical than another. This is shown by the phrase " Frutices foliis pinnato-decompositis, digitatis, pinnatis vel simplicibus," where " digitatis " is intercalated between " pinnato-decompositis " and " pinnatis." There is nothing to show that he considered any one species as a " type." The type-method had not then (1855) been developed. *Prima facie* it might appear that one of the four pinnate-leaved species mentioned by Miquel should have been chosen as lectotype, rather than the fifth which was simple-leaved; and *N. fruticosum* (L.) Miq. has actually been treated as the type (Philipp. Journ. Sc., Bot. vii. 241 : 1912). But Miquel obviously included also the six simple and digitate-leaved New Zealand species of *Panax* recognized in 1853 by J. D. Hooker (Fl. N.Z. i. 93). There were therefore in *Nothopanax* Miq. (1855) 4 pinnate-leaved species as against 7 with simple or digitate leaves. When *Nothopanax* Miq. was divided, the pinnate-leaved species were transferred to *Polyscias*, leaving only the simple and digitate group. It was therefore legitimate to retain the name *Nothopanax* Miq. for the latter, since Miquel had not indicated a type. As *N. cochleatum* (Lam.) Miq. was the only member of this group specified by Miquel, it has strong claims to be chosen as lectotype. The relevant synonymy of *Polyscias* and *Nothopanax* is appended.

Polyscias *J. R. et G. Forst.* Char. Gen. 63, t. 32 (1776); Dalla Torre et Harms, Gen. Siphonog. 363, n. 5859 (1903). *Nothopanax* Miq. (Fl. Ind. Bat. i. pt. 1, 765 : 1855), partim (species foliis pinnato-decompositis vel pinnatis includens).

Type species : *P. pinnata* J. R. et G. Forst.

Nothopanax *Miq.* Fl. Ind. Bat. i. pt. 1, 765 (1855), emend. Harms in Engl. u. Prantl, Pflanzenfam. iii. Abt. 8, 47 (1894) (species foliis digitatis vel simplicibus includens); Dalla Torre et Harms, Gen. Siphonog. 363, n. 5864 (1903); Cheeseman, Man. N.Z. Fl. ed. 2, 633 (1925).

Lectotype-species : *N. cochleatum* (Lam.) Miq.

The following conclusions may be drawn from the study of the case of *Nothopanax*, and are here submitted for the consideration of botanists, in view of the preparation in the near future of "Regulations for determining types" for submission to the next International Botanical Congress.

1. Where an author, in publishing a genus containing more than one species, has failed to indicate a type-species or type-subdivision, it is open to a subsequent worker to choose a lectotype-species from those originally mentioned by name as belonging to the genus.
2. In choosing a lectotype-species, one of the guiding considerations should be the retention, as far as possible, of continuity in nomenclature.
3. Where part of the genus has been transferred to an earlier genus, the generic name should if possible be retained for the residuum.
4. The first choice of a lectotype is final, unless it can be clearly shown that it was made against the weight of evidence.

Harms's application of the name *Nothopanax* is in conformity with considerations 1–3, and his implicit choice of *N. cochleatum* (Lam.) Miq. should therefore not be reversed.

XVIII—PETROSAVIA AND PROTOLIRION.

J. HUTCHINSON.

In 1871 Beccari* published a description and drawing of a very interesting monocotyledonous plant from Mt. Poe, Borneo, and named it *Petrosavia stellaris* Becc., in honour of Dr. Pietro Savi, Professor of Botany, Pisa University. He referred his new genus to the family *Melanthaceae*, a group generally included as a part of *Liliaceae*. It was described as a parasite, and very remarkable in having an apocarpous gynaecium, a feature rarely met with in Monocotyledons, apart from *Alismaceae* and allied families, and quite unknown in *Melanthaceae*, or in a broader sense, *Liliaceae*. Bentham & Hooker, in the Genera Plantarum, included the genus with doubt in the *Liliaceae*, referring it to the tribe *Narthecieae*, wherein free styles sometimes occur; and a similar position is maintained for it in both editions of Engler & Prantl's Pflanzenfamilien.

Early in the year 1891 Mr. H. N. Ridley discovered a plant in Perak, in the Malay Peninsula, which he determined from description to be *Petrosavia stellaris* Becc. He described it as a small yellow saprophyte. Mr. Ridley's material was studied in detail a few years later by the late Professor Percy Groom, who published his results in the Annals of Botany, vol. ix. pp. 45-58 (1895). On histological evidence he discounted Beccari's statement as to the plant being a parasite, and as Mr. Ridley also failed to find evidence supporting it, he concluded the plant was a saprophyte. Professor Groom pointed out that Mr. Ridley's specimens did not seem to agree exactly with Beccari's description, especially in regard to the carpels which Beccari stated to be " ex ima basi libera," whilst Professor Groom found them to be apparently connate at the base. Mr. Ridley therefore redescribed his Malay specimens as a new genus and species, *Protolirion paradoxum* Ridl., but unfortunately had not an opportunity of actually comparing his material with Beccari's type specimen.

In connection with my studies on the phylogeny and classification of Monocotyledons, I was struck with the great resemblance of Mr. Ridley's specimens at Kew and Beccari's figure, and through the courtesy of Professor G. Negri, Director of the Botanical Institute in Florence, the type specimen has been sent to Kew for examination. Beccari's specimen after dissection proves to be the same as Mr. Ridley's *Protolirion* from the Malay Peninsula, the bases of the otherwise free carpels being slightly immersed in and concrescent with the thick turbinate receptacle, exactly as described by Professor Groom.

The literature and records of the species are now as follows:—

Petrosavia stellaris *Beccari* Nuov. Giorn. Bot. Ital. iii. 7, t. 1 (1871); Ridley in Journ. Straits Branch Roy. Asiat. Soc. 1891, 170; Groom in Ann. Bot. vi. 380 (1892). *Protolirion paradoxum* Ridley in Ann. Bot. ix. 56 (1895); Groom. l.c. 45; Ridley Fl. Mal. Penins. iv. 322, fig. 195 (1914).

---

*Nuov. Giorn. Bot. Ital. iii. 7, t. 1 (1871).

MALAY PENINSULA: not uncommon at 1000–3000 ft., in Gunong Tahan, Pahang; Thaiping Hills, Perak; Sungei Siput, Gunong Bubu, and Kedah Peak (see Ridley Fl. Mal. Penins. iv. 322).

BORNEO: Mt. Poe, about 3000 ft., Aug. 1866, *Beccari* 2399 (type).

XIX—MISCELLANEOUS NOTES.

CHARLES ALFRED BARBER.—It is with deep regret that we have to record the death of Dr. C. A. Barber, who passed away on February 23rd, 1933. Barber commenced his scientific training when as a young man he was employed in the Liverpool and Manchester District Bank. During his leisure time he studied science, chiefly geology, and passed the First Science Examination of London University. In 1883, at the age of 23, he decided to abandon his commercial career and to devote himself to science. Regarding a knowledge of German as essential for a scientific student, he studied for a year at Bonn University, and then entered Christ's College, Cambridge, where he became a scholar. He passed both parts of the Natural Science Tripos with first class honours, taking Botany as his chief subject, and in 1889 was appointed University Demonstrator in Botany at the University. His work at this time and later was greatly enhanced by his facility as a botanical artist.

Two years later he accepted the post of Superintendent of the Botanical and Agricultural Department of the Leeward Islands and, after spending some time working at Kew, left for Antigua late in 1891. The lot of a scientific officer in a tropical Agricultural Department was not in those days a happy one, as he was expected to have a cure at hand for all the ills which affected the industry. Since he failed to do this, Barber's services were not fully appreciated; the post was abolished by the local Legislature in 1895, and much useful fundamental research which Barber had carried out was wasted.

For some time after this he held the post of Professor of Botany at Cooper's Hill, until in 1898 he was appointed Government Botanist in Madras. His duties there included the Directorship of the Botanical Survey of South India, and for the first few years of his service he devoted most of his time to collecting material for the Madras Flora. Some time after his arrival in Madras, the attention of Government was drawn to the serious loss to Forest Revenues which was being caused by the " spike " disease of sandal, and Barber was called upon to investigate this. His careful research on the root parasitism of sandal and other species of parasitic plants is published in the Botanical Memoirs of the Department of Agriculture in India, and his work on this subject in particular qualified him for the degree of Sc.D.

His experience of the sugarcane crop while serving in the Leeward Islands was a great help to him when called upon to investigate the causes of the decline of the sugarcane industry in the Godavari district. With the thoroughness which was so conspicuous in all work which Barber undertook he decided that he could do no good until he had studied in detail the growing cane and all aspects of its cultivation. Accordingly he obtained sanction to open a cane-station in the Godavari delta. Later on, he opened two other stations in connection with investigations which he was called upon to make into the causes underlying the decrease in the acreage of groundnuts and into the causes for " pepper wilt " in the Wynaad. He thus obtained an insight into many aspects of arable and plantation agriculture under tropical conditions.

In 1912 he was appointed by the Government of India to the post of Sugarcane Expert and immediately set about studying the morphology and habit of the Indian canes, especially those of N. India. The results of this work are published in a series of Botanical Memoirs of the Agricultural Department in India entitled " Studies in Indian Sugarcane." The main objective of this study was the production of superior varieties to suit the short growing season of N. India, and this he accomplished by crossing Indian canes with the wild *Saccharum spontaneum*. The fact that Bremer's work in Java on the cytology of Indian cane varieties supports Barber's classification based on morphological characters alone is a remarkable tribute to the accuracy of the latter's work.

In 1918 the Honour of Companion of the Indian Empire was conferred on him and he retired in 1919. The rest of his life he spent in Cambridge, where for several years he held the post of Lecturer in Tropical Agriculture at the University.

The Madras Presidency owes a deep debt of gratitude to Barber for the part he played in laying the foundations of its Agricultural Department and in training so many of its officers. He was a good friend to all who knew him well, and was ever ready to place his knowledge at their disposal.

The New Botanical Laboratories, University of Toronto.—The new Botanical Laboratories at Toronto University were formally opened on June 8th, 1932, in the presence of the Prime Minister, the Chancellor of the University, the Chairman of the Board of Governors, the President, and a distinguished gathering of visiting botanists, together with Prof. R. B. Thomson and his botanical staff. The occasion was also happily marked by the conferment of the honorary degree of Doctor of Science on Prof. A. C. Seward, who was representing Great Britain as an invited guest at the ceremony. The Report of the opening, which has just reached us, gives an interesting account of the ceremony, when the Prime Minister, Mr. G. S. Henry, unlocked the door and delivered an introductory speech. The Chairman of the Board of Governors, the Hon. Dr. H. J. Cody, followed with an outline of the history of the department and a description of the new building. Sir Robert Falconer then greeted the visiting delegates and called upon Prof. Seward, Dr. Wiegand, Cornell, Dr. H. T. Güssow, Ottowa, Prof. Marie-Victorin and Prof. F. E. Lloyd to address the meeting. The proceedings were terminated by brief speeches from Sir William Mulock and Dr. Cody.

The building is a stately Renaissance edifice, built of stone from the Credit Valley and Queenston. It consists of a basement, ground floor and two floors above, and is provided with an ample number of lecture rooms, laboratories, research rooms, a library and all the other requirements of an up-to-date botanical institution.

Closely connected with the new building a fine range of plant houses has been erected, consisting at present of seven good greenhouses for cool and tropical plants, ferns, orchids and succulents, with the necessary ranges for propagation and experimental work. As far, therefore, as glasshouses are concerned, Toronto now possesses the nucleus of a botanic garden valuable both for research purposes and for the instruction and edification of the general public.

Prof. Thomson is to be warmly congratulated on the successful realisation of the plans which he has had in mind for so many years, and the University of Toronto is also to be congratulated in possessing as fine a botanical institute as may be found in any other centre of learning and research.

Natural Varnish Resins.—An interesting collection of natural varnish resins has recently been presented to Kew by Mr. T. Hedley Barry, Consulting Chemist, author of a newly published work on this subject. The specimens comprising this collection have been procured by the donor from different parts of the world during the course of many years' work on the chemistry and origins of natural resins, and they have been utilized in supplying much of the data that is incorporated in the new volume. As Mr. Hedley Barry has exercised great care in ascertaining the correct botanical identity of his specimens—no light task with so many resins occurring in little-developed tropical countries—and has secured the co-operation of forest officials and botanists in the various countries of origin in obtaining material, his collection, which has been arranged as a special exhibit in Museum No. 1, is regarded as a very valuable one.

The new work,* containing nearly 300 pages, expands and brings up-to-date the information contained in an earlier treatise on natural resins by the same author. It is divided into two parts, the first of which deals with the history and botanical origin of resins and their physical and chemical properties in general. In the second part individual resins are dealt with and a chapter is devoted to each

---

*Natural Varnish Resins, by T. Hedley Barry, Ernest Benn Ltd., London, 1932. Pp. xxiii + 294, ill. 84. Price 42*s.* 0*d.* net.

group. Among the large number of photographs that are reproduced there are many that are of special interest, for example those of resin-yielding trees in their natural habitats. Several maps showing the detailed distribution of resins accompany the text, and references to literature are given.

The natural resin industry has undergone great changes in recent years. Many that appeared on the markets in former years are now no longer exploited. On the other hand among certain grades production has been increased. Many of these changes are no doubt due to the competition that has arisen by the production of low-priced synthetic resins. It is fitting, therefore, that, at this stage, a comprehensive work embracing the whole field of natural varnish resins should appear, for it is probable that much of the information incorporated might otherwise have passed unrecorded or remained inaccessible. The author has obviously carried out a large amount of careful research in its compilation and the work constitutes a valuable contribution to the knowledge of the subject.

The Protection of Wild Flowers.—Under this title the Wild Plant Conservation Board has issued a pamphlet, mainly for the use of schools, dealing with the preservation of our native flora. The causes of the diminution of many of our wild flowers are discussed, and special emphasis is laid on the part that can be played by both teachers and pupils in preserving our flora for posterity. The pamphlet can be obtained from the General Secretary, the Council for the Preservation of Rural England, 17 Great Marlborough Street, W.1, at a cost of 1*s.* 6*d.* per dozen, if ordered in bulk; single copies will be supplied free to individual teachers who apply, enclosing postage.

Printed under the authority of HIS MAJESTY'S STATIONERY OFFICE
By the South Essex Recorders, Ltd., High Road, Ilford.

(114) Wt. 71/28 925 5/33 S.E.R. Ltd. Gp. 9.

BULLETIN OF MISCELLANEOUS INFORMATION No. 4 1933
ROYAL BOTANIC GARDENS, KEW

XX—SARRACENIA PURPUREA VAR. STOLONIFERA.

A NOTEWORTHY MORPHOLOGICAL AND ECOLOGICAL TYPE.

JOHN M. MACFARLANE AND D. WALTER STECKBECK.

DESCRIPTION OF LOCALITY.

In response to a request by the late Dr. Maxwell Masters, the senior author published a short paper in the " Gardeners' Chronicle " for 1895 (series 3, xvii. 643) entitled " Sarracenias at Home." The article mainly treated of an excursion into the Southern United States undertaken, along with one of his students, nearly a year before, chiefly for field study of the native pitcher plants or Sarracenias. In a few concluding sentences the author wrote as follows: " You will scarcely credit the show that our native *S. purpurea* at times makes. About three weeks after my southern tour I was botanizing in New Jersey, and was carried by train past a lake bordered by the plants. I determined to make an inspection and did not regret it. The lake was about a quarter of a mile long. Its margin was covered by a continuous sheet of large specimens mostly of deep crimson hue.

" To look down on a piled up mass of pitchers, seven to twelve feet in width and mostly floating on the water, was a sight indeed. I hope some day to photograph the view and you will then be able to share the pleasure.

" In the sheltered bays of this lake floating beds of the purple bladderwort (*Utricularia purpurea*) in full bloom, alternated with sunken logs that were carpeted with *Drosera rotundifolia* and *D. intermedia*. A real carnivorous garden you will say and such it was."

Many readers of the above, who are familiar with *S. purpurea* in its native haunts, may incline to query the possible correctness of such a description. For in the numerous and extensive expeditions made by the senior author of this article during the past forty-one years, from eastern Canada and Maine south to northern Florida and the coast of Louisiana, he has encountered no locality which would compare with that now to be described, nor any growths of pitchers and of stems comparable in size to those now figured.

First acquaintance was made with the locality in mid July 1894, when the senior author along with one of his little sons—then four years old—was rapidly carried by train along the railroad embankment that rose about ten feet above the edge of the pond or lake.

His eye quickly and with delight took in the scene, while the exclamation came from the small boy at his side " Oh, Papa, see the Sarracenias ! " For, over almost the entire shore margin that stretched away obliquely for about a quarter of a mile from the point of view, dense growths of *Sarracenia purpurea* extended. These varied in colour from rich crimson in sunny places to greenish-crimson or almost green in the shade, while their large pitchers bordered the shore often in continuous masses to a width of from two to frequently ten or even twelve feet. They produced a beautiful colour effect against the sparkling water and the tall cedar woods beyond, which anchored their roots among those of the Sarracenias. The timetable indicated that a "flag station," Davenport, had just been passed, and that Whitings was five and a quarter miles ahead in the direction of Camden and Philadelphia.

Needless to say, the writer resolved to visit so attractive a locality and to explore its riches. This was done about three weeks later when staying at Island Heights, a village about three miles east from Toms River. Around the lake on every side stretched undulating, sandy expanses of typical pine barrens soil on which grew a flora eminently characteristic of that region. This will be described later by the second author. But, looking westward along the railroad for about three hundred yards, the desired locality seemed to be in view, for both sides of the track were bordered by tall growths of the white swamp cedar or cypress (*Chamaecyparis thyoides* or *C. sphaeroidea*) which suggested swamp or even lake expanses. On nearer approach it was found that the railway had been carried over a bridge, beneath which flowed a stream whose waters were of the typical pine barrens yellow-brown tint.

The stream issued from a pond or small lake on the left, which, after the bridge was crossed, gradually came into full view as an obliquely extended expanse of water. This was almost wholly encircled by tall growths of the white cedar whose trunks grew in the shallow water or in the shaded bordering sphagnum margin. This shaded area reached from ten to fifteen feet from the edge of the pond. A wide recess or bay had formed for about twenty feet to the left of the outlet, and here a striking scene was visible from our high vantage ground on the railroad. A few snags had drifted down and accumulated over the waters of this bay, in part submerged, in part exposed. These had entangled great beds of the purple bladderwort (*Utricularia purpurea*), whose floating masses formed a sheet of lavender-purple bloom. Along the moist sides of the logs or spreading over the sandy bay-shore were abundant patches of *Drosera rotundifolia* and *D. intermedia.*

As the sketch-plan indicates, the lake, fully a third of a mile long, was of irregular and sinuous outline, its median line being a curve that extended from the out-flowing stream upward to where the lake again contracted into a gently moving and largely sphagnum-bestrewn current continuing for miles to the westward.

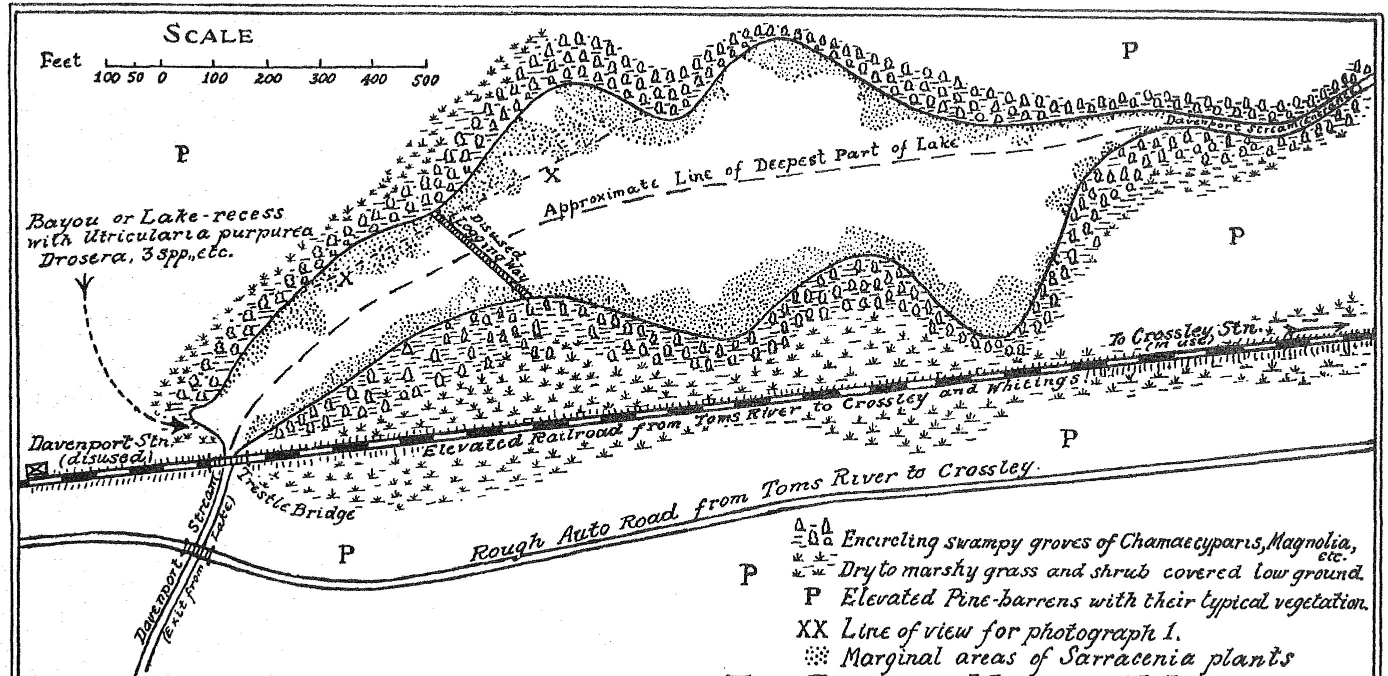

SCALE
Feet 100 50 0 100 200 300 400 500
P
P
P
P
P
P
X
X
Bayou or Lake-recess with Utricularia purpurea Drosera, 3 spp., etc.
Approximate Line of Deepest Part of Lake
Disused Logging Way
Davenport Stream (Entrance)
Davenport Stn. (disused)
Trestle Bridge
Davenport Stream (Exit from Lake)
Elevated Railroad from Toms River to Crossley and Whitings
To Crossley Stn. (in use)
Rough Auto Road from Toms River to Crossley
Encircling swampy groves of Chamaecyparis, Magnolia, etc.
Dry to marshy grass and shrub covered low ground
P Elevated Pine-barrens with their typical vegetation
XX Line of view for photograph 1.
Marginal areas of Sarracenia plants

DIAGRAM OF DAVENPORT LAKE BETWEEN TOMS RIVER AND WHITINGS, N.J.

From a study of the entire lake, as well as of its inlet and outlet areas, its history was evidently somewhat as follows. Originally a small continuous stream that arose in the higher moist lands near Whitings, it flowed for about two miles in a south-easterly direction, then turned north-eastward for nearly nine miles as Davenport Branch when it joined two lesser streams, Wrangel Branch and Sunken Branch. These together formed a somewhat enlarged pond which in turn narrowed into a stream emptying into the Toms River at the county seat of that name.

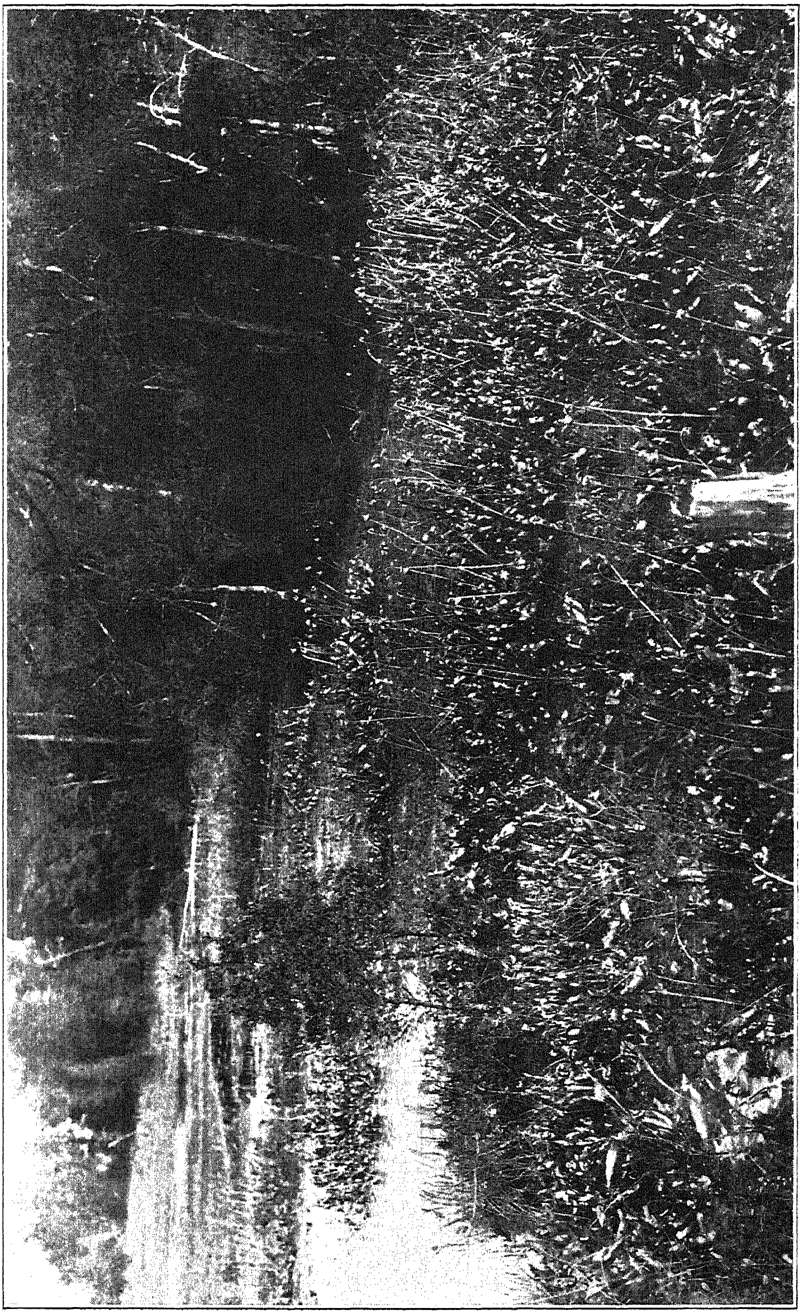
Many years ago, however, the Pennsylvania Railroad was first cut through, and continued from Whitings to Toms River and onward. In the process a railroad embankment was formed that cut across the depression in the midst of which Davenport Branch flowed. In constructing the embankment a trestle bridge about fifteen feet long was built across the actual stream. During spring freshets this embankment formed a slight temporary dam and restricted the flood water to the one outlet channel, which in the course of time was excavated so as to produce a pond that steadily increased in width and depth. Into this expanding lake, under normal environal conditions, a gentle precipitation of decomposing animal and vegetable remains was carried downward. These remains together with the inorganic mud gave rise to a fine, silty deposit or muck over the sandy lake floor. This evidently formed an exceptionally rich and loose soil in which plants of *Sarracenia* could readily root while the protruding pitchers above could capture an ample supply of insects.

Such clearly must have been the conditions which favoured an abundant growth of luxuriant *Sarracenia* plants. The soft, silty muck now varies in depth from three to twelve inches along the shore line, to as much as two or three feet in deeper water. The deepest parts of the lake, along its median curved line, are from four to six feet deep.

At the time of the first visit in 1894 many of the white cedars were tall, thick trees which, along with those of lesser growth, formed an imposing cincture to the pond margin. About ten years later, however, the larger trees were cut out, and this seemed to admit abundant sunlight which gave crimson colour to the pitcher plants beneath, as well as to those farther out in the open. The surface of the pond margin that had been invaded by the Sarracenias was on an average three feet in width, but in places as much as ten to twelve feet. So solidly were the plants grown together, and so closely rooted amid the sphagum and silty mud, that one inclined almost to step out amongst them as if on firm ground.

Mention has been made of the varying colour of the leaves of the *Sarracenia* plants. These showed a transition from uniform green in the deeper shade of the cedars, swamp magnolias and swamp blueberries, to a dark crimson-purple hue over the entire surface of the pitcher where fully exposed to strong sunlight. A similar

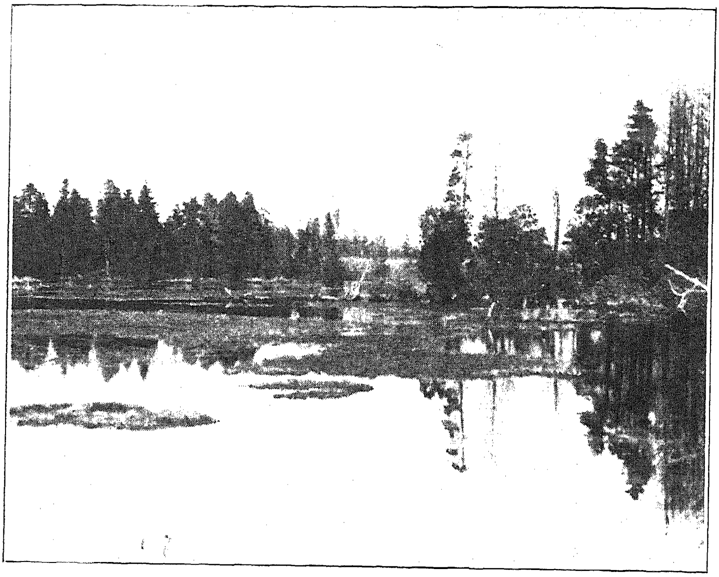
PLATE X



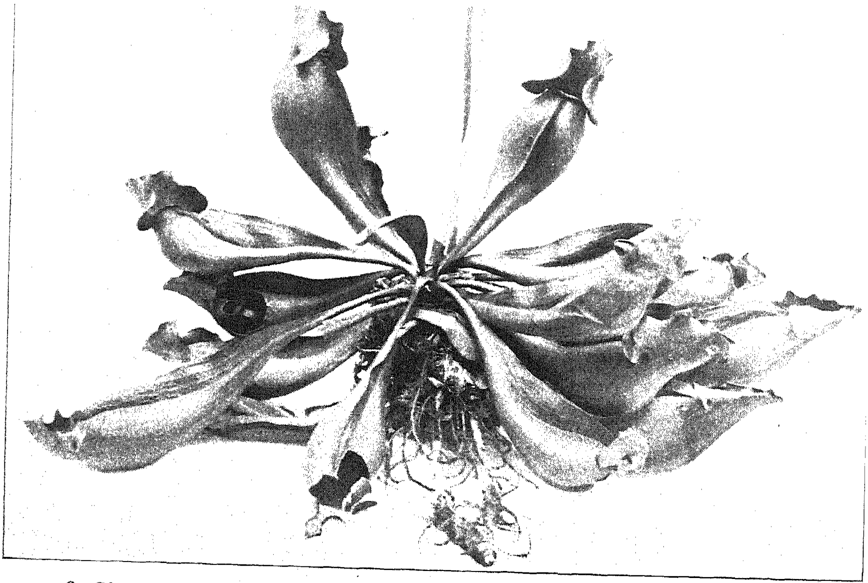
1. Masses of *Sarracenia purpurea* var. *stolonifera*, from 3 ft. to 12 ft. wide. Photograph taken along line xx in sketch-map.

[*To face page* 164.

PLATE XI



2. General view of widest part of lake.



3. Single plant of *Sarracenia purpurea* var. *stolonifera* (greatly reduced) in late May, showing 7 new leaves of the current year surmounting 7 still fresh or slightly withered leaves of previous season, and a few withered remnants of still older leaves. Widest diameter

variability is observable also from northern Maine southward to northern Florida, or for a distance of 1300 miles, and is equally characteristic for such southern species as *S. Drummondii* and *S. psittacina*. The colour of the upper leaf surface in Venus' flytrap and the tint of the tentacular hairs in leaves of the native sundews vary in the same way.

When seen at this time (August) the plants showed thousands of strong, upright fruiting stalks, rising conspicuously above the dense masses of pitchers which made up each huge patch. The stalks varied in height from 14 to 19 ins. and in thickness from ⅛ to ¼ in. Occasionally withered remnants of the petals could be traced, but the five large spreading and persistent green to purplish sepals were conspicuous, surrounding the large maturing fruit. While not a few of the fruits were maturing normally or had recently burst their carpels, many showed the serious havoc caused by the depredations of the larval stage of *Exyra Rolandiana*. This small moth attacks the carpels and soft young seeds, feeding on them and so reducing their tissues to a pulpy condition. They unquestionably cause great destruction to, and reduction of, the total quantity of seeds matured. This subject has been very thoroughly investigated by Dr. Frank M. Jones in a series of valuable papers* which have been published during the past few years.

At irregularly succeeding periods, the senior author conducted various excursions with his students and with members of scientific societies to the region. He therefore had opportunities for studying the area and its local flora. Several of these observers have secured photographs illustrating both the plants and their surroundings. Special mention should be made of the views secured by Dr. Herbert Kribs, by Dr. Walter Steckbeck the junior author of this paper, and by Dr. W. Randolph Taylor. The first of these observers obtained some pictures of great detail and to him the present authors are grateful for permission to have one of them reproduced.

Comparative study, then, throughout these years has shown that the plants of this limited area deserve to be regarded as a distinct variety. They differ strikingly in many structural details from the normal form, *S. purpurea* var. *typica* (Macfarl. in Pflanzenreich, Sarraceniaceae, 33). Accordingly specimens have been deposited in the Kew Herbarium, in that of the University of Pennsylvania and in various other herbaria of America and Europe.

The following is a description of this variety.

S. purpurea, *var* **stolonifera** Macfarl. et Steckb.

Rhizoma elongatum usque ad 51 cm. longum, incrementa annua 1·25–3·2 cm. longa formans, ramulos laterales spatiis interiectis gerens rhizomati parenti similes atque interiectis 5–8 annis putrefacti ab eo separantes. *Ascidia* 10–45 cm. longa, parte tertia inferiore solida, partibus duabus superioribus cavis; ala usque ad 2·5 cm.

---

*The most important of these appeared in Natural History, xxi. no. 3, 296–316 (1921).

lata; os 1·5–2·8 cm. diametro; pedunculis elongatus usque ad 47·5 cm. longus. *Flos* quam in var. *typica* tertia parte vel dimidio major.

PERIOD OF BLOOMING.

During the last thirteen years observations have been made by the junior author on the blooming periods of this plant at Davenport and Crossley. Some sixteen trips were taken to the region; most of these were made in the latter part of May when the pitcher-plant is in various stages of flowering, and when many other plants of the pine-barrens are at their climax of blooming.

The results of these studies indicate that the average climax of flower expansion, that is when practically all flowers in a given area are fully open, is about May 28th. The earliest season was that of 1921 when spring in this latitude was unusually early. By May 21st of that year *Sarracenia* was past its best for flowering. The latest of the twelve seasons was that of 1924 when on May 31st barely ⅓ of the flowers had lengthened their petals. The spring of 1928 was about as late as that of 1924, and the climax of blooming was delayed to June 4th.

Flower buds are noted on the *Sarracenia* plants early in May or even late in April. Gradually the stout pedicels elongate, the buds swell, and in an early season one may look for the first open flowers shortly after the middle of May, but the beginning of flower-opening obviously depends on the seasonal conditions. After complete expansion of the purplish-red petals, a period of six to nine days elapses before the showy corolla withers and drops, its work in attracting insect visitors having been accomplished. With the petals go the numerous stamens, and even in late seasons by June 15th only persistent bracts, sepals and pistil remain, the last consisting of developing ovary, the elongated lower half and the umbrella-like upper half of the style that bears five small stigmas between the tips of its pentagonal lobes.

ENVIRONAL PLANT ASSOCIATES.

While *Sarracenia* holds first place in importance for the visitor to Crossley during May, yet a considerable number of other plants then in bloom adds to the interest. Along the water's edge one finds lingering clusters of *Orontium aquaticum.* Somewhat out from the banks of the stream *Eriocaulon* is just opening its capitula of flowers. One of the showiest pine-barrens companions of the pitcher plant is *Xerophyllum asphodeloides*, sending up long racemes of numerous flowers. At this time one may look for such other plants in bloom as *Arethusa bulbosa*, *Cypripedium acaule*, *Leucothoë racemosa*, *Leiophyllum* (*Ledum*) *buxifolium*, with flowers well past their climax, *Arctostaphylos Uva-ursi*, in full bloom a month earlier but at times showing a lingering flower, *Euphorbia Ipecacuanhae*, *Hudsonia ericoides*, *Pyxidanthera barbulata*, nearly over, *Pyrus arbutifolia*, *Helianthemum canadense*, *Linaria canadensis*, *Arenaria caroliniana*, in large bud and well on to full bloom before *Sarracenia* passes, species of *Vaccinium* and *Gaylussacia, Kalmia latifolia* and *K. angustifolia*, both in large bud or just opened, etc. Of special interest are the three species of *Drosera*—*D. rotundifolia, D. intermedia*, and *D. filiformis*—all very common but blooming after the pitcher plants.

ANATOMY OF THE RHIZOME.

A study and comparison of numerous sections of rhizomes of different ages and varying sizes indicate a relatively simple anatomy. In common with rhizomes of many other species of plants, one of the main functions of this type is storage of reserve foods. In the present variety of *Sarracenia* starch is stored in abundance in large cortical and pith areas. Another prominent anatomical feature is the presence of aerenchyma in the cortex and to a lesser degree in the pith.

The young rhizome shows four main areas, the epidermis, cortex, vascular bundles and pith. The epidermal cells are small and scarcely larger than, or different in shape from, the small cells of the exocortex, but the former are thicker-walled than the latter. The epidermal cells are slightly cutinized over their outer walls and prominently lignified along their inner walls. These cells soon become brownish in content, and later fragment off irregularly, so as to leave the outer cortex as the surface layer. The wide cortex has many large lacunae, constituting the aerating tissue that is so common in submerged plant parts. Practically every cell of the cortex shows an abundance of stored starch, as do the cells of the pith.

The bundles are arranged in a circle that is broken by the fairly wide medullary rays. The individual bundle is open, collateral and consists of a small area of phloem, a poorly-differentiated cambium and a well defined xylem. Protoxylem is but faintly indicated. The pericycle of the young stem can be traced only by the presence of very small groups of bast fibres bounding the bundles. The pith is continuous and, as indicated above, closely resembles the cortex in structure and in function.

In comparison the older and larger rhizomes present changes in the anatomy of the different tissues. Increase in width of the areas, and so in the diameter of the stem, is noted in cortex, vascular bundles and pith. Quite frequently the epidermis has sloughed off. The outer cortex becomes more and more lignified as development continues. No cork is formed, as tests for suberin give negative results.

The bundles show radial and lateral increase in size but not so pronounced as is the increase in cortex, and to a lesser degree in pith. In no instance can any indication of annual rings in the xylem be observed, even though the oldest stems examined were at least twelve to fifteen years old, as determined by several external features. A greater degree of lignification in the wood fibres is seen as the stem becomes older. Very few wood-parenchyma cells, containing small starch grains, are scattered through the xylem areas.

The relative insignificance of mechanical tissues at all stages of growth in the stem is noteworthy. The comparatively small amount of bast fibres, derived from the pericycle, and the equally small amount of wood fibre constitute the supporting system; for the rhizome, supported as it is by the surrounding water, needs little mechanical strengthening.

The absence of annual rings in the xylem, as noted before, may be explained by the fact that growth of vascular tissues is more or less continuous throughout the year, while persistence of the leaves through the winter and up till June of the succeeding season should be noted in this connection. The temperature below the surface of the water probably does not drop low enough to stop growth entirely.

DESTRUCTION OF PLANTS.

It seems appropriate that attention should here be drawn to a regrettable occurrence which in May 1931 came to the notice of both writers. On reaching the Crossley locality they were surprised to discover that along the northern margin of the lake great destruction and removal of almost the entire crop of pitchers of the previous season had taken place. On passing later to the farther or south side of the lake a sad condition was revealed. For, at three different centres, piles of dead pitchers of the last year's growth were heaped high on the bank a few feet from the shore. These were in a withered and nearly dry state and, when turned over, revealed great masses of still fresh or half decayed pitchers beneath. Closer examination of this south shore showed that by aid of grappling irons, some of which had been left behind, a wholesale destruction of the plants had been effected; some had been left in the above withering state, while others had evidently been carried away in heaps.

The present authors have since learned that this act of wanton destruction had been carried out with the object of securing material for pharmaceutical investigation into the chemical and physiological properties of the plant. Considerable study has already been conducted, from the time of Dr. Porcher onward, along this line with fairly definite results. It is highly regrettable therefore that needless destruction should have been effected in so interesting a locality and on a variety of the species so remarkable alike in size and mode of growth.

The senior writer has tried on several occasions during the past thirty years to interest different organizations in the project of purchasing the locality as a sanctuary that surely should be secured inviolate for future generations. As yet these efforts have proved wholly fruitless.

AFFINITIES OF THE SARRACENIACEAE.

The senior author now desires to refer to a paper published by him in 1893 under the title "Observations on Pitchered Insectivorous

Plants" (Annals of Botany, vii. 440: 1893). He observes, "I have already stated that the Sarraceniaceae show many points of affinity in flower-structure with the Nepenthaceae." He then compares the morphological details of the two families side by side, and makes the following remarks: "The agreement of the above characters establishes not a mere analogy, or remote relationship between two orders [families], as botanists have hitherto supposed, but gives to all the genera a common ordinal [family] value; for the herbaceous or semi-shrubby mode of growth, presence or absence of tracheids in the tissues and of petals in the flowers, the distinct or fused stamens, and other points of difference, are not sufficient, and have not been made sufficient by systematists hithertc, for the separation of genera that otherwise show decided affinities. The following condensed description would enable us to diagnose readily from all others a family which might appropriately be termed the [Nepenthaceae or] Ascidiaceae :—

"Glandular herbs or under-shrubs, inhabiting swamps and wet places; .... leaves with or without flattened lamina, sometimes tendriliform, ascidiform, and adapted for insect-catching; flowers regular, solitary, or racemose, hermaphrodite or dioecious, entomophilous; sepals, five, four or three, green or coloured, hypogynous; petals, five, four or absent, greenish or coloured when present; stamens indefinite (rarely definite), hypogynous, free or connate into a tube, anthers two-celled; pistil syncarpous, of five, four or three carpels, with central (axile) placentation; ovules anatropous, horizontal or ascending; styles short, with truncate flattened or expanded extremity, bearing five, four or three stigmatic lobes; fruit a capsule, surrounded by the persistent calyx and dehiscing loculicidally into five, four or three lobes when ripe; seeds small, ovoid, elongate-appendiculate or winged, testa crustaceous or loosely reticulate; albumen fleshy; embryo straight in the albumen."

Whether the above suggestions be accepted or not, the writer would definitely affirm that all fundamental facts of structure, of morphological affinity and of geographic distribution clearly indicate a continuity in time relationship among these genera and species that is as intimate as it is suggestive. For the elongated and lignified stem of *S. purpurea* var. *stolonifera* that bears occasional lateral shoots, the persistence of it for from ten to twenty years at least, the elongated annual growths that show distinct internodes, the deeply sheathing leaf bases, the separation of each leaf into a petiolar, lower, solid half and a laminar, upper, ascidiform half, the development of alluring, attractive, conducting, and detentive surfaces that ensure the capture of insects are not merely morphologically similar or analogous but constitute identities or homologues. When one adds to the above that *Heliamphora* of northern South America and *Darlingtonia* of California and Oregon, represent connecting links in the above chain of identities, the close agreement is greatly strengthened.

XXI—NEW TREES AND SHRUBS FROM TROPICAL AFRICA: II.* A. C. HOYLE & H. DUNKLEY.

Triumfetta palmatiloba *Dunkley*, sp. nov. [Tiliaceae]; affinis *T. digitatae* Sprague et Hutch. a qua petiolis valde longioribus foliis paullum ultra medium 5-lobatis nunquam 7-lobatis staminibus paucioribus, ovario 3-loculare recedit.

Frutex erectus, ramulis crassis cum petiolis et inflorescentia scabrido-stellato-pustulatis, perulis subulatis setoso-ciliatis. *Folia* paullum ultra medium palmatiloba, basi late cordata vel truncata, lobis oblongis acutis irregulariter serratis, supra sparse pilis stellatis adpressis scabrida, subtus minute incano-stellato-tomentella, nervis venisque elevatis ferrugineo-stellato-pubescentibus; petioli 5–6 cm. longi. *Cymae* terminales, breviter pedunculatae, ad 5 cm. latae, circiter 10-florae, bracteis lineari-subulatis 6–8 mm. longis. *Sepala* basin versus cucullata, 10·5 mm. longa, cornu 1 mm. longo. *Petala* 10·5 mm. longa, spatulato-oblonga, apice truncato-serrata, superne glabra, basin versus angustata, ungue fortiter falcato et stellato-tomentoso. *Stamina* circiter 30; filamenta 10 mm. longa. *Ovarium* sessile, depresso-globosum, pilosum, triloculare; ovula in loculis 2, pendula. *Discus* dense villosus. *Fructus* 4–5 cm. diametro aculeis inclusis; aculei subulato-filiformes, molliter pubescentes.

SOUTH TROPICAL AFRICA. Northern Rhodesia: Miwali, Abercorn, *O. B. Miller* D.100, 151. "The natives use the pounded roots as a cure for some stomach complaint." Native name "Nakalotye" (W).

Afzelia caudata *Hoyle*, sp. nov. [Caesalpiniaceae]; affinis *A. bipindensi* Harms, a qua calycis tubo 25–35 mm. longo crassiore, foliolis tenuiter chartaceis vel membranaceis longe et anguste caudato-acuminatis, recedit.

Arbor magna, 30 m. alta et 80 cm. diametro, praeter inflorescentiam glabra, ramulis novellis tenuibus leviter incano-brunneis striatulis sparse lenticellatis. *Folia* paripinnata, 3–4 (–8 ?)-jugata, petiolo 3–5 cm. longo, cum rhachide tenue minute striato, rhachide 7–13 cm. longo, petiolulis usque ad 5 mm. longis, in genere tenuibus; foliola juvenilia tenuiter chartacea vel membranacea, pellucida, supra nitidula, 7–12 cm. longa, 4–6 cm. lata, ovata vel elliptica vel late oblongo-elliptica, apice plus minusve subito et tenue caudato-acuminata (acumine usque ad 2 cm. longo, acuto, mucronulato), basi late cuneata vel rotundata, nervis lateralibus praecipuis utrinque 9–12 tenuibus arcuatis utrinque subprominentibus, nervis secundi ordinis et venis reticulatis vix minus conspicuis. *Inflorescentia* non visa, sed floribus disjunctis ut videtur sessilibus magnis. *Calyx* coriaceus, extus ferrugineo-tomentellus, tubo crasso 25–35 mm. longo 3–5 mm. lato, lobis 4 inaequalibus intus glabris majoribus obovatis 20 mm. longis 12 mm. latis relictis late elliptico-oblongis 15 mm. longis 9–10 mm. latis. *Petalum* circiter 3·5 cm. longum,

---

* Continued from K.B. 1932, 270.

2 cm. latum, ungue crassiusculo basin versus et in latere interiore breviter pubescente. *Stamina* 6–7, basin versus breviter et sparse villosa, 3–4 cm. longa; staminodia 2, breviora, tenuiora, dense villosa. *Ovarium* 1 cm. longum, basi et in una sutura sparse pubescens vel fere glabrum, longistipitatum, ultra calycis tubum 5 mm. exsertum, stylo filiforme 3 cm. longo vel ultra glabro. *Legumen* magnum, lignosum, compressum, late ellipticum, 15 cm. longum, 12 cm. latum, 3–4 cm. crassum, a latere in pedicello crassissimo dispositum. *Semina* ± 7, magna, anguste ovoidea, ± compressa, 4–5 cm. longa, 2–2·5 cm. lata, 1–1·5 cm. crassa, nigra, nitidissima, basi arillo cupulare aurato irregulariter lobato circiter 1·5 cm. longo munita.

WEST TROPICAL AFRICA. Nigeria: (Ibadan District ?) *W. D. MacGregor* 540, type, with flowers, in Kew Herb. and Imperial Forestry Institute Herb., Oxford; Road to Ijebuode from Akilla, *J. D. Kennedy* 2375, seedling, with fruit; Western Provinces, Ondo, *A. H. Unwin* 91, seeds only. Gaboon: Kouilou, *Sargos* (?) 228, seeds only.

The fruit described above is taken from *Kennedy* 2375, comprising a seedling of a "large tree 100 ft. high and 8 ft. girth," together with the fruit of this tree, the leaves being either inaccessible or the tree leafless. The fruit is undoubtedly from an *Afzelia*, and the leaflets match those of the type here described (*MacGregor* 540, with young leaves and flowers), which have a very slender acumen, a feature shared by no other *Afzelia* yet described. The size and extreme beauty of the large jet-black seeds with short golden yellow aril, make the species especially distinct. The pod resembles that of *A. africana* in size and in being attached at right angles to a very stout pedicel, while the flowers approach those of *A. bipindensis*, from which they differ chiefly in the very stout and long calyx-tube, 25–35 mm. long, instead of 15–20 mm.

Macrolobium Vignei *Hoyle*, sp. nov. [Caesalpiniaceae]; affinis *M. isopetalo* Harms et *M. obanensi* Bak. f., ab illo inflorescentia crassiore et breviore densius tomentosa, calycis tubo longiore et lobis brevioribus, ab hoc inflorescentia multo breviore, bracteolis sero caducis, foliolis caudato-acuminatis, differt.

Arbor mediocris riparia, ramulis novellis purpureo-brunneis ferrugineo-tomentosis demum glabrescentibus cortice cinereo fibrato. *Stipulae* caducissimae. *Folia* pari- vel abortu imparipinnata, 2–3-jugata, petiolo 0·5–1·5 cm. longo basi tumido ruguloso brunneo-tomentoso, rhachide 3–9 cm. longo tenue plus minusve striato brunneo-pubescente glabrescente; foliola opposita vel rarius subopposita, tenuiter coriacea, integerrima, infima ovata, 3–6 cm. longa, 2–3 cm. lata, basi subcordata vel rotundata, reliqua elliptica vel elliptico-oblonga, 7–14 cm. longa, 3–5 cm. lata, basi cuneata vel rotundata, apice gradatim caudato-acuminata, saepe mucronata, supra glabra, obscurissime et tenuiter reticulata, costa impressa, infra reticulata, rufo-brunneo-pubescentia praecipue in costa et nervis, fere tandem glabra, nervis lateralibus utrinque 5–6 arcuatim fortiter adscendentibus cum costa infra prominentibus; petioluli in sicco nigrescentes, 3–5 mm. longi, brunneo-pubescentes vel tomentosi. *Paniculae* terminales vel rare axillares, interdum subfasciculatae, breviter pedunculatae, circiter 12 cm. longae et 6–8 cm. latae, rhachide brunneo-tomentoso, ramulis 3–4 cm. longis ferrugineo-tomentosis; bracteae caducissimae, bracteolis deciduis obovatis 7 mm. longis 5–6 mm. latis extus ferrugineo-tomentosis intus pubescentibus. *Calyx* glaber, tubo 5–6 mm. longo 3 mm. lato glabro, lobis 3–4 mm. longis late ellipticis inaequalibus. *Petala* 4, posteriore glabro obovato bifido unguiculato 5–7 mm. longo, ungue sparse piloso, reliquis minutis. *Stamina* 3, filamentis 7–9 mm. longis basi pubescentibus. *Ovarium* oblongum, breviter stipitatum, ferrugineo-hirsutum, 6–7 mm. longum, stylo 7–9 mm. longo. *Legumen* late oblongum, lignoso-coriaceum, compressum, 10–11 cm. longum, 5–5·5 cm. latum, rugulosum, densissime atro-brunneo-tomentellum, pedicello crasso 7 mm. longo. *Semina* 2, majus circiter 4 cm. longum et latum, compressum.

WEST TROPICAL AFRICA. Gold Coast: N. Province, Axim District, near Dompim, on river-bank, *C. Vigne* 1968 in Kew Herb. and Imperial Forestry Institute Herb., Oxford, type, with flowers and young fruits; same locality on banks of Bonsa River, *C. Vigne* 1397, with fruits. A medium tree with spreading crown, 40–50 ft. high and 4 ft. girth, brownish-black velvety pods.

Vernacular name (Wassaw) "Totuabo" or "Tutuabo."

Calpocalyx cauliflorus *Hoyle*, sp. nov. [Mimosaceae]; affinis *C. Winkleri* Harms, a qua paniculis valde laxioribus longe pedunculatis haud terminalibus, calycis tubo glabro, bracteolis crassioribus, foliis et petiolis longioribus, foliolis pluribus, recedit.

Arbor alta, ramulis striatis puberulis. *Fōlia* bipinnata, magna; pinnae unijugatae; petiolus 14 cm. longus, crassiusculus, teres, pulvinatus, striatus, puberulus, glande magna inter bases pinnarum munitus; rhachides pinnarum striati, circiter 45 cm. longi, in sicco brunnei, inter petiolulos omnium jugarum glande muniti; petioluli quadrangulares, in sicco nigri, 3–5 mm. longi; foliola chartacea, 7–8-jugata, opposita, jugis 4–6 cm. distantibus (foliolo singulare pinnae super pulvino circiter 1 cm. disposito), 12 cm. longa, 4·5–6 cm. lata, oblongo-elliptica (foliolo infimo ovato-elliptico), apice caudato-acuminata, acumine 1·2 cm. longo mucronulato, basi obtuse cuneata vel rotundata, margine integerrimo, supra glabra, plus minusve glauca, minute glanduloso-punctata, infra primum in costa et nervis praecipuis minute puberula, tenuiter reticulata, nervis lateralibus praecipuis utrinque 6–8 infra prominentibus valde arcuatis, saepius et tenuiter conjunctis paucis inter hos minus prominentibus nervis e costa abeuntibus. *Paniculae* cauliflorae, elongatae, laxae, usque ad 40 cm. longae vel ultra, primum ferrugineo-tomentellae, pedunculo 8–10 cm. longo, ramulis spicatis circiter 12 cm. longis tenuibus, bracteis principibus caducissimis, floribus subsessilibus confertis, bracteolis minutis cuneatis caducis. *Calyx* turbinatus, 1·5 mm. longus, ruber, glaber, 5-dentatus, dentibus ciliolulatis. *Corolla* extus ferrugineo-tomentella, intus glabra, tubo 2 mm. longo, lobis oblongis acutis valvatis 2 mm. longis. *Stamina* 10, 5 mm. longa, antheris 1 mm. longis apice glande magna caducissima munitis, filamentis complanatis basi cum disco tenui conjunctis ; discus corollae basi adnatus. *Ovarium* breviter stipitatum, obovoideum, 1 mm. longum, ferrugineo-pilosum ; stylus filiformis, 3·5 mm. longus, stigmate minuto truncato.

WEST TROPICAL AFRICA. Nigeria : Ikom Division, *D. R. Rosevear* 40/30A (fl.) and 39/30A (leaves), type, in Kew Herb. and Imperial Forestry Institute Herb., Oxford. "A myrmecophilous tree in secondary forest, with cauliflorous flowers, a very striking sight ; three or four trees together ; leaves and flowers were from the same tree" (*Rosevear*).

Albizzia flavovirens *Hoyle*, sp. nov. [Mimosaceae] ; affinis *A. versicolori* Welw., a qua pinnis foliolisque pluribus, rhachidibus inter omnes jugas pinnarum et inter omnes fere jugas foliolorum glande munitis, pedunculis et pedicellis tenuioribus, recedit.

Arbor parva, ramulis novellis, follis et inflorescentia ± dense flavo-viridi-tomentosis vel pubescentibus. *Ramuli* teretes, striati, obscure lenticellati. *Folia* magna, bipinnata, usque ad 30 cm. longa et lata (in statu florescente), petiolo 4–8 cm. longo, rhachide 8–12 cm. longo, cum glande inter unoquamque jugam pinnarum munito, petiolo et rhachide alte striato, pinnis 4–6 jugatis oppositis vel infimis suboppositis, rhachide tenuiusculo alte striato cum glande inter unoquamque jugam foliolorum munito (vel glande infima nulla) ; foliola 3–8-jugata, opposita, crasse chartacea, 2–6 cm. longa, 1–3·5 cm. lata, subsessilia, rhomboidea vel superiora obovato-falcata, apice obtusa vel rotundata, mucronulata, basi inaequilateralia, rotundata vel oblique truncata, margine integerrimo dense ciliato, supra mox glabra, reticulata, infra primum incano- vel fulvo-tomentosa, tandem pubescentia, reticulata ; costa excentrica, in foliolis infimis diagonalis ; nervi laterales utrinque 6–9. *Pedunculi* subfasciculati in axillis foliorum juvenilium, tenuiusculi, 6–9 cm. longi, 1–1·5 mm. crassi, alte striati, tomentosi ; bracteae mox deciduae, lineari-lanceolatae, 3–5 mm. longae, dense fulvo-tomentosae, bracteolis ultimis subaequilongis stipitatis rhomboideis acuminatis. *Flores* in capitulo circiter 20, pedicellis 2–3 mm. longis. *Calyx* 5–6 mm. longus, dentatus, tubo 2–2·5 mm. lato, aureo-tomentellus. *Corollae tubus* 7–8 mm. longus, fere glaber, lobis 3–4 mm. longis oblongis acutis fulvo-tomentellis. *Stamina* 3·5–4 mm. longa, basi in tubo 6 mm. longo connato. *Ovarium* glabrum, 5 mm. longum, stylo filiformi 2·5 cm. longo vel ultra.

WEST TROPICAL AFRICA. Nigeria : Obubra Station, *D. R. Rosevear* 36/31, in Kew Herb. and Imperial Forestry Institute Herb., Oxford, type !

Fagara melanorhachis *Hoyle*, sp. nov. [Rutaceae]; affinis *F. macrophyllae* Engl., foliis tamen haud armatis, foliolis latioribus breviter acuminatis, petiolulis longiusculis, floribus minoribus, differt.

Arbor fere glabra, ramulis novellis atrobrunneis vel nigris minutissime puberulis crassis lenticellato-striatis sparse et breviter armatis, cortice tandem cinereo. *Folia* pinnata, 50–100 cm. longa, rhachidibus et petiolulis in sicco atrobrunneis vel nigris striatis minutissime puberulis, petiolo 10–18 cm. rhachide 25–70 cm. longo, petiolulis 7–10 mm. longis; foliola utrinque 16–26, tenuiter coriacea, minute pellucido-punctulata, subopposita vel alternantia, 12–20 cm. longa, 5–8 cm. lata, oblique oblongo-elliptica, apice acuminata, basi valde inaequalia, latere superiore rotundato latere inferiore angustato, supra nitidula, utrinsecus laxe recticulata, obscuriuscule glanduloso-punctulata, margine integerrimo vel obscurissime crenulato; nervi laterales utrinque 12–16, subprominentes, prope marginem duplo allicti, inter eos nervis obscurioribus e costa abeuntes; costa supra vix impressa, infra prominens, minutissime puberula vel glabra. *Paniculae* amplae, patentes, usque ad 50 cm. longae, rhachide nigrescente angulato vix armato, ramis puberulis, floribus unisexualibus (masculis visi solis) sessilibus et subglomerulatis in ramulis puberulis subspicatis; bracteae bracteolaeque minutae, puberulae, caducissimae. *Calyx* puberulus, intra 1 mm. longus, obtuse 5-dentatus, dentibus apertis ciliolatis. *Petala* 5, oblongo-elliptica, obtusa, leviter imbricata, 2 mm. longa, glabra, glandulosa. *Stamina* 5, filamentis 2–2·5 mm. longis complanatis. *Discus* magnus, carnosulus, late ovoideo-conicus, glaber, 1·5 mm. diametro, ± 5-lobatus. *Ovarium* abortivum conicum, in apice disci dispositum.

WEST TROPICAL AFRICA. Nigeria: Sapoba, *J. D. Kennedy* 2297 in Kew Herb. and Imperial Forestry Institute Herb., Oxford, type. Same locality, *Kennedy* 337. "No prickles on leaves." Flowers April to June.

Vernacular name (Benin) "Okor."

XXII—A STUDY OF VARIATION IN GLAUCIUM FLAVUM. W. B. TURRILL.

TAXONOMIC HISTORY.

The common yellow horn (or horned) poppy is a striking plant when in flower and has attracted attention throughout historic times. Thus, Theophrastus, Enquiry into Plants, IX. xii. par. 3, transl. Hort, ii. 279 (1916), says "There are several kinds of wild poppy: the one called the horned poppy is black: the leaf of this is like that of the black mullein, but it is not so black; the stem grows about a cubit high, the root is stout and shallow, the fruit is twisted like a little horn: it is gathered at the time of wheat harvest. It has the property of purging the belly, and the leaf is used for removing ulcers on sheeps' eyes. It grows by the sea, wherever there is rocky ground." It may be noted that Sir Arthur Hort, l.c. 490, identifies this plant, μήκων ἡ κερατιτις as *Glaucium flavum* var. *Serpierii*.

The plant was also well-known to the pre-Linnean botanists and herbalists, but it is not essential for our present purpose to quote these in detail. The modern botanical history of the species begins with Linnaeus who gave it the name of *Chelidonium Glaucium* (Sp. Pl. 506: 1753). His brief description reads: "Chelidonium pedunculis unifloris, foliis amplexicaulibus sinuatis, caule glabro," and, with the synonyms he cites, is sufficient to fix the species in a general sense. For "habitat" he gives "in Angliae, Helvetiae, Galliae, Italiae, Virginiae arenosis." In the second edition of the Species Plantarum (724: 1762) Linnaeus adds the following description "Planta glauca. Caulis laevis. Folia scabriuscula: radicalibus pinnatifidis; caulinis solum lobatis. Flores flavi. Siliquae scabrae, dissepimento in loculamenta, uti sequentes, distinctae." *Glaucium* (sub nom. *Chelidonio*) *corniculatum* is described (ed. 1) as "Chelidonium pedunculis unifloris, foliis sessilibus pinnatifidis, caule hispido," and in ed. 2 a var. "β. Papaver corniculatum phoeniceum glabrum. *Bauh. pin.* 171" is added and an additional description given: "Planta viridis. Folia omnia pinnatifida. Flores rubro lutei. Siliquae hispidae," with the habitat "in Hungaria, Bohemia, Monspelii." By the use of the symbol ⊙ Linnaeus regards both species as annual. In the Linnean Herbarium there is one sheet written up *Chelidonium Glaucium*. The specimen is in young flower only, without even immature fruits. The following are characters of the specimen: lower leaves decidedly hairy, upper nearly glabrous with few scattered hairs, rather large and not deeply lobed; flower-stalks glabrous; sepals with scattered bristly hairs; petals about 3 cm. long. One sheet is also written up *Chelidonium corniculatum*. The characters of the flower and young fruit are those of *Glaucium corniculatum* as generally accepted—small red flowers, ovary and young fruit strongly clothed with adpressed hairs.

An account of the origin of the name "*Glaucium*" and its mythological connection with the yellow horn poppy is given in Sowerby's English Botany, ed. 3, Syme, i. 98 (1863).

Botanically, the name γλαύχιον was applied by Dioscorides to herbs which, when wounded, yielded a yellow juice (Pfeiffer, Nomencl. Bot. i. pt. 2, 1450: 1874). In approximately its present usage it was employed by Tournefort, Instit. ed. 3, i. 254 (1719). The plate (t. 130) shows, in addition to an open flower, petal, and flower-bud, a glabrous ovary and glabrous fruits. In the English edition, 1719 (with numerous additions from other works), a much enlarged account of the genus is given (i. 554) and a re-engraving of the plate, with very slight modifications, is printed as t. 131. It is evident that Tournefort included in his genus what we now call *Glaucium flavum* (*G. luteum*) and *G. corniculatum* and excluded *Chelidonium majus*, (l.c. 231, t. 116). Adanson (Fam. des Plantes, ii. 432: 1763) accepted Tournefort's two genera and it is somewhat strange they should have been united by Linnaeus. Bentham and Hooker (Gen. Plant. i. 53 : 1862) quote Juss. Gen. 236 (1789) as the authority for the generic name in the sense in which they use it. Jussieu, l.c., certainly gives a clear definition of the genus *Glaucium* sufficing to distinguish it from *Chelidonium* sensu stricto. Yet, Crantz, Stirp. Austr., fasc. ii. 133 (1763), defined *Chelidonium* and *Glaucium* as separate genera, admonishing Linnaeus for errors in both generic and specific descriptions. Under the genus *Glaucium* Crantz describes two species, *G. flavum* and *G. phoeniceum*. Although the Linnean names are not cited there is no doubt from the synonymy that the names are intended to replace *Chelidonium Glaucium* and *C. corniculatum* respectively. By the latest rules of botanical nomenclature the combination *Glaucium Glaucium* is not allowed and Crantz's name *G. flavum*, antedating *G. luteum* Scop., Flor. Carn. ed. 2, i. 369 (1772), is valid. On the other hand *G. phoeniceum* Crantz does not retain the Linnean trivial *corniculatum* and must be replaced by *G. corniculatum* (L.) Curt. Flor. Lond. fasc. vi. t. 32 (1798).

RELATIONSHIPS AND VARIATIONS.

Fedde, in his account of the genus *Glaucium* in Das Pflanzenr. Heft 40 (iv. 104), 221–238 (1909), does not classify the 21 species he accepts into subgenera or other taxonomic divisions. In his Clavis the first separation is into A, those species with the ovary more or less pilose or somewhat prickly and B, those species with the ovary provided with tubercled, prickly, or scale-like papillae or glabrous, not pilose. In the former group are placed, with other species, *G. corniculatum* Curt. and *G. grandiflorum* Boiss. et Huet ; in the latter *G. flavum* Crantz and *G. leiocarpum* Boiss.

The difficulty of making a satisfactory classification of available material into species is well illustrated by comparing Fedde's account (which is based largely on that of Boissier in Flor. Or. i. 119 et seq. : 1867) with that of Otto Kuntze in Act. Hort. Petrop. x, 147 et seq. (1887). Kuntze gives an interesting account of the characters supposed by different authors to be valid for separating species, and shows conclusively that these characters occur in many combinations only some of which have been accepted as diagnostic for species. As a result of his investigations he sinks all the species of the genus known to him as " Varietäten etc." under the one name *Glaucium corniculatum* Crantz em. While acknowledging that, from the purely morphological standpoint, there is something to be said for Kuntze's conclusions these cannot be accepted as a whole because he has not considered the relationship of geographical and ecological criteria to the gross morphological criteria alone used by him. That petal-colours, types of capsule indumentum, types of indumentum of vegetative parts, size of flowers, and shapes of leaves do show a degree of independent variation is true, though the linkage of characters is rather greater than Kuntze admits. When, however, we find, as we do, that certain character combinations are constant, except for a few exceptions usually explicable by alien introduction, for geographical regions or definite (ecological) habitats, we have to review Kuntze's conclusions with the aid of facts he ignored. Unfortunately, neither experimental (genetical, cultural) nor cytological data are yet available to aid in a taxonomic study, and proposed division into and arrangement of species must, therefore, be of a highly tentative nature, as is most taxonomic theory.

Glaucium corniculatum Curt., with its distinct rather setose indumentum of usually adpressed hairs on the ovaries and capsules, and its occurrence as a weed of arable land, a constituent of the open vegetation of dry stony slopes, or of loose soil not associated with coastal conditions, is considered a separate species from *G. flavum*. It is true that *G. corniculatum* shows a large range of petal colour and also that some of the species grouped round it are very doubtfully distinct from it. We are, however, concerned here with *G. flavum* and a survey of the material preserved at Kew will indicate the polymorphy of this species. With some exceptions in the Nearer East (see below), *G. flavum* is limited, as a native plant, to sand-dunes, shingle-beaches, and other habitats near the coast or to river-beds (rarely).

British Isles: *G. flavum* occurs on the coasts of all or nearly all our maritime counties. Druce (Comital Flora of the British Isles, 14: 1932) gives the vice-county records as 52 [6]. H.16. S., and says "thins out or disappears on the northern Scottish shores. Extinct in the single Zetland station. All round Ireland." At Kew there are 40 localized collectings of the plant from the British Isles and the following notes are based on these and on field studies. The species is most often biennial or perennial. In luxuriance of development it is rather readily modified by environmental factors. There is a considerable range in the degree of development of the indumentum in the cauline vegetative parts from glabrous (St. Ouen's Bay, Jersey, *Turrill* 3039), few to very few scattered hairs (Hunstanton, Norfolk, *Miss Bell*), to a thick pubescence, especially on the leaves (Par Sands, Cornwall, *Pascal*). The degree of leaf cutting of the cauline leaves varies considerably but the range is less than in the Mediterranean Region. There is a tendency for the less highly divided and frequently larger leaves to be the more glabrous. The flower stalk is usually glabrous, rarely (e.g. Gosport, Hants, *Adams*, and Yarmouth, *Paget*) with scattered distinct rather long hairs. The sepals in all the specimens examined have scattered rather long distinct hairs fluctuating in number. The petals range from 2·5 cm. to 3·5 cm. in length and from 2 cm. to 3·8 cm. in breadth. The ovaries and young fruits are nearly always rough with closely set, very small tubercles. As the fruit matures it becomes relatively smoother by the spacing out and more or less complete obliteration of the tubercles. Much more rarely the tubercles are replaced by more distinct asperities (Instow, Devon, *Watson*, and Swansea, *Moggridge*). The fruit develops to a great length, up to 28 cm. (and probably more), and is usually rather flattened, 4–5 mm. broad when mature. The developing fruit is occasionally constricted at intervals (Yarmouth, *Paget*) or contorted, St. Abbe's Head, Berwick, *Balfour*).

Scandinavia: The material available from Scandinavia is meagre. The specimens seen come within the range of variation shown by British examples and have glabrous flower stalks and mature fruits. Blytt (Norges Flora, iii. 951: 1876) gives a number of localities, but recognizes no varieties. Lindman (Svensk Fanerogamflora, 267: 1918) records it from Sweden, but without quoting specimens, and also recognises no varieties.

Central Europe: In Central Europe *G. flavum* is nowhere originally wild but occurs in many places as a multiplied garden escape or as an alien of ballast and rubbish heaps. A list of localities is given by Hegi (Illustr. Flor. v. Mitt.-Eur. iv. pt. 1, 23: 1913). The range of variation in the material available is not great. The papillose asperities or small tubercles on the immature fruits are frequently well developed. The fruits usually agree with those of specimens from the Atlantic coasts, but on one from Vaud (*Favrat and Barbey*) are more slender but long.

Iberian Peninsula and France: Willkomm and Lange (Prodr. Flor. Hispan, iii. 874: 1880) describe two varieties in the following terms:

α. *vestitum*, foliis magis minusve pilosis, capsula scabriuscula.
β. *glabratum*, foliis glabris, capsula laevi.

The species is said to occur "in arenosis maritimis totius Hispaniae, raro in interiore," and a considerable list of localities is given. Coutinho for Portugal (Flor. de Port. 243: 1913) and Rouy and Foucaud (Flor. de France 164: 1893) retain the same two varieties. Again, the species is most often found near the coast or can be traced from the coast up the river-valleys, though, in the south it occasionally occurs on hill slopes or in fields. The descriptions attached to the varieties suggest a definite correlation between the presence or absence of indumentum of the vegetative parts and the presence or absence of scabridity of the capsules. There is no example at Kew showing glabrous basal leaves. The degree of indumentum shown by the cauline leaves ranges from very dense (in arenosis maritimis, near Oporto) to none (Plombiers, *Bonnet*). The uppermost leaves are usually much more nearly glabrous than those below. The capsules when ripe are glabrous or have a few scattered asperities, but the number of papillose asperities on the immature fruits varies from numerous (Rampart Tivoli à Dijon, *Bonnet*) to few (Ribiers, *Reverchon*) and independently of the hairiness of the foliage. One specimen from near Oporto, "in arenosis maritimis," deserves special mention. The leaves are densely hairy and the (single) very young fruit is closely covered with papillae elongated almost to the length of hairs. The flower-stalks are generally glabrous or (near Monfalcone, 1862) have a few coarse hairs. The flower size is small to medium and the capsules are on the whole shorter and more slender than in British material. A specimen such as that collected by *David* near Tallard (Herb. Borel) is scarcely distinguishable from *G. leiocarpum* Boiss. (see below).

Corsica, Sardinia, Italy, and *Sicily*: Briquet (Prodr. Flor. Corse, ii. 3 : 1913) states that in Corsica the species inhabits " sables littoraux, d'où il remonte çà et là le long des cours d'eau jusque dans l'intérieur, par. ex. à Ponte alla Leccia." He believes that variations in indumentum, of the foliage " nous paraissent être en rapport avec le milieu et n'avoir qu'une valeur individuelle." Moris (Flor. Sardoa, i. 80 : 1837) records it " in arenosis maritimis Sardiniae et insularum la Maddalena, Tavolara, frequens." He distinguishes no varieties. Fiori e Paoletti (Flor. Anal. d'Ital. i. 484 : 1898) say the plant occurs " nelle arene mar. della Pen., Istria ed isole; raram. importato entro terra." Pojero (Flor. Sicula i. 56 : 1888) says " spiagge arenose lapidose ovunque in Sicilia e nelle Isole, raramente nell' interno." The range of variation appears to be similar to that in the French material, except for the occurrence of larger petals and glabrous (to very nearly glabrous) sepals on one specimen (Apulia loc. glareosis ad littora maris adriat. circa Rodi, *Porta et Rigo*), and that ripe fruits usually approximate in length and diameter to British material, though Corsican material has more slender capsules.

Balkan Peninsula and Eastern Mediterranean Region. In the large area considered under the above title *Glaucium flavum* shows its maximum variation. Names have been given to plants showing combinations of characters which it is here concluded come within the one species. These must be considered in some detail.

Boissier (Flor. Or. i. 122 : 1867) described *G. leiocarpum,* quoting ten collections from Asia Minor, Syria, and North Persia. Fedde retains the species and extends its accepted area of distribution both westwards (to Crete and Naxos) and eastwards (" Tukmenien "), Hayek (Prodr. Flor. Penins. Balc. i. 353 : 1925) also retains the species, and gives its distribution for the Balkan Peninsula as Dobruja, Thrace, Cyclades, and Crete, from all of which areas he also records *G. flavum.* Several of the collections cited by Boissier are at Kew in addition to much material of *G. flavum* sensu lato not cited by him. It is evident that what authors have accepted as *G. leiocarpum* extends from the Balkan Peninsula eastwards, and what they have accepted as *G. luteum* extends mainly, though not entirely, westwards. The diagnostic characters used by the above authors to distinguish *G. leiocarpum* from *G. flavum* are :—

(1) more slender often twisted stems ;
(2) upper leaves smaller ;
(3) sepals glabrous ;
(4) petals " lateritio-fulva " ;
(5) fruits shorter, more slender, smooth, and often subattenuated between the seeds.

The characters under (1) and (2) show such fluctuation in both eastern and western material that only a statistical study on much more extensive material than is available could show their worth. There is apparently a tendency for plants of the *flavum* group to be less robust as one traces them eastwards. The sepals are not glabrous in authenticated material of *G. leiocarpum* (e.g. Antilebanon, *Gaillardet* 390). The question of flower-colour is dealt with separately below. This leaves the fruit characters for consideration. Without doubt the fruits are usually shorter, more slender, and more narrowly cylindrical, and in the stages of their development show a greater tendency to glabrescence in plants from Asia Minor, named sometimes *G. luteum* (*flavum*) sometimes *G. leiocarpum*, than in plants from the Atlantic coastlands named *G. luteum*. The constriction of the fruit between the seeds (siliqua inter semina saepius subattenuata) is fairly well seen in Gaillardet's specimen already quoted but in few others and is almost certainly a fluctuating character. It is, e.g., not seen in *Kotschy* 13 from the Taurus. The critical point is whether the fruit shape, size, and glabrescence, are so constant, show so high a correlation, and distinct geographical or ecological distribution that they can reasonably be given specific value. Gaillardet's specimen is taken as a standard of *G. leiocarpum*.

No specimens from the British Isles, Scandinavia, the Iberian Peninsula, or Central Europe have been seen which have been or could be definitely considered *G. leiocarpum*. Much French material, however, has shorter, more cylindrical, and more glabrescent capsules (e.g. near Tallard, *David*, Herb. Borel). Corsican material has slender, Sardinian and Sicilian broader capsules. Cretan material shows rather broad (*Reverchen*, La Canée) or nearly cylindric and short capsules (*Heldreich*, Grabusa). The last specimen approximates to *G. leiocarpum* but the fruits have a rather greater diameter (4 mm.) and the young ovaries are strongly papillose above.

The only Greek material seen is from Laurion. This is all named *G. Serpieri* Heldr. (Gartenflora, xxii. 325 : 1873). Heldreich's account is not accompanied by a full Latin description but one is provided in Boiss. Flor. Or. Suppl. 24 (1888). Heldreich emphasizes the Crocus-yellow colour of the flowers with a dark violet blotch at the base of each petal, the large flowers, and glaucous, deeply bipinnatipartite leaves with small end lobes. There is one sheet at Kew collected at Laurion by Heldreich in 1873 which agrees well with his account except that the flowers are no larger than those of many western European specimens. The mature fruits are glabrous, cylindrical, and short like those of accepted *G. leiocarpum* material. We have, however, to note specimens collected on Laurion by Haussknecht (1885) and by Heldreich (No. 1107 : 1890, two sheets). These have foliage indistinguishable from that of western material, but have shorter fruits which are either cylindrical or (No. 1107, one sheet) show some tendency to broaden. The flower-stalks are glabrous and the sepals have setose hairs. Ignoring flower colour for the moment, it appears that *G. Serpieri* comes within the variation range of *G. leiocarpum* as understood by Boissier and has no close connection with *G. grandiflorum.*

Material from the Cyclades, South (Greek) Macedonia, Thrace, and Bulgaria again shows the shorter, more cylindrical, glabrous capsules assumed to be characteristic of *G. leiocarpum.* In Dalmatia, Croatia, and Istria, a greater mixture of types is apparent. From Ragusa (*Adamović*) is a specimen with glabrous pedicels and fruits, the latter approximately cylindric and showing attenuation between the seeds. Other specimens (Lesina, *Alexander Prior*; near Zeleniko, *K. Maly*) have setose-hispid pedicels and more or less asperous (immature) fruits. The degree of indumentum development on the vegetative parts and the flower size, also show a wide range. On the basis of comparison with plants from the Adriatic coastlands alone it would appear that "*G. leiocarpum*" is to be included in *G. flavum.*

In Europe *G. flavum*, even in the wide sense, is most often limited to the sea-coast or to habitats with loose soil and open vegetation not far from the coast. Occasionally it occurs on the stony, sandy débris of river valleys liable to flood (as in South France) or, as a casual, in more inland stations. In Asia Minor, and probably also farther east in Persia, it occurs naturally inland as well as near the coast, and, like specimens from Syria, Palestine, and Cyprus, most often shows at least some of the characters of *G. leiocarpum* Boiss. Leaf-shape, indumentum, and flower-size, range as widely as in ordinary European material. The sepals may be strongly setose (Lycaonia, *Heldreich*) or nearly glabrous (near Angora, *Lindsay* 56). The pedicels are generally glabrous, more rarely with a few bristly hairs, and the fruits usually approximate to the *leiocarpum* type, though material like that of Bové 456 (near Gaza and Jaffa) is difficult to sort on fruit characters. Flower size shows a wide range.

Heldreich (l.c., 1873) describes and figures (t. 776) a "double-flowered" variation of his *G. Serpieri.* Haussknecht, in Mitth. Thur. bot. Ver. iii.–iv. 101 (1893), gives this as var. *plenum* of *G. flavum.* The occurrence of flowers, in *Glaucium*, with petals multiplied to the extent shown in Heldreich's figure must result from a rare mutation.

The question of variation in flower colour requires further investigation than is possible from dried herbarium material. The petals of most western European plants are yellow. Fedde says "aurea, lucide flava vel sordide lutea." The var *fulvum* (as species Smith, Exot. bot. i. 11, t. 7: 1804) has petals described as "lateritio-coccinea, basi flava." *G. Serpieri* (*G. flavum* var. *Serpieri* Hausskn.) is said to have the petals "crocea basi violaceo- vel purpureo-maculata," and *G. tricolor* Godr. "petalis rubro-aurantiacis basi maculatis." Boissier, in his original description gives *G. leiocarpum* "petalis lateritio-fulvis." One can say, in general, that the range of colour variations, and especially the occurrence of deeper colours, increases as one goes from east to west, to reach a maximum in Asia Minor.

No structural differences have been detected between ripe seeds of members of the *G. flavum* group.

For quick comparison of one plant with another, for tracing the geographical distribution of characters, and for the scoring of populations in the field, in such a species as *Glaucium flavum* as here understood, a designation of varieties by symbolic formulae is better than attaching a name with a more or less perfect description to some only of the variation-combinations and ignoring others. It is true that a really satisfactory scheme can only be prepared after a species has been extensively and intensively studied by experimental and field methods (see Marsden-Jones & Turrill in Kew Bull. 1929, 168 & 1931, 136), but the possibility of using such a scheme on ordinary herbarium material is worth a trial. The following symbols are suggested for *G. flavum* :

S.1. stem hairy (bristly).
2. stem glabrous.
L.1. cauline leaves hairy (bristly).
2. cauline leaves glabrous.
3. cauline leaves entire or very slightly lobed.
4. cauline leaves more or less deeply lobed.
P.1. flower stalk hairy (bristly).
2. flower stalk glabrous.
K.1. sepals hairy (bristly).
2. sepals glabrous.
C.1. petals 3 cm. or less in length.
2. petals more than 3 cm. long.
*3. petals pale yellow (apart from any basal blotch).
*4. petals of another colour than pale yellow.
5. petals with basal blotch.
6. petals without basal blotch.
G.1. ovaries and young fruits rough.
2. ovaries and young fruits smooth.
F.1. mature fruits 20 cm. or less in length.
2. mature fruits more than 20 cm. in length.
3. mature fruits 4 mm. or less in breadth.
4. mature fruits more than 4 mm. in breadth.
5. fruits contorted.
6. fruits not contorted.
7. fruits constricted between the seeds.
8. fruits not constricted between the seeds.

Examples of the application of this scheme are :
Hurst Castle, Hants, *Turrill* 3040.
S.2. L.1.4. P.2. K.2. C.1.3.6. G.1. F.2.4.6.8.

---

*Fuller investigations, with living material, are necessary before colour characters can be satisfactorily classified and symbolized.

St. Ouen's Bay, Jersey, *Turrill* 3039.
S.2. L.2.4. P.2. K.2. C.1.3.6. G.1. F.—
Bohuslan, Sweden, *Lagerstedt.*
S.2. L.1-2.4. P.1. K.2. C.1.3.6. G.1. F.2.4.6.8.
St. Piler, France, *David.*
S.2. L.1.4. P.2. K.2. C.1.— G.1. F.1.3.6.8.
St. Canée, Crete, *Reverchon.*
S.2. L.1.4. P.2. K.1. C.1.3.6. G.1. F.2.4.6.8.
Laurion, *Heldreich* (as G. *Serpieri*).
S.2. L.1.4. P.2. K.1. C.2 (?).4.5. G.1. F.1.3.6.7.8.
Athos, *Chick* 67.
S.1. L.1.4. P.2. K.2. C.2.4.6.(?). G.1. F.—
Ragusa, *Adamović.*
S.2. L.1.4. P.2. K.1-2. C.— G.2. F.1.3.6.7.
Near Zelenika, *Maly.*
S.1. L.1.4. P.1. K.1. C.2— G.1. F.1.3.6.8.
Near Triest, *coll.* ?
S.1. L.1.4. P.1. K.1. C.1.— G.1. F.1.4.6.8.
Schvitizza, *Staub.*
S.2. L.2.4. P.2. K.— C.— G.1. F.1.3.6.7-8.
Egin, Armenia, *Sintenis* 2622.
S.2. L.2.4. P.2. K.2. C.2.4.5. G.2. F.1.3.6.7(?).
Barrada Gorge, Antilebanon, *Gaillardet* 390.
S.2. L.2.3. P.2. K.1. C.— G.2. F.1.3.6.7.
Larnaka, Cyprus, *Sintenis et Rigo* 897.
S.2. L.1.4. P.2. K.1. C.1.4.6.(?). G.1. F.1.3.6.8.

CONCLUSIONS : The intensive study of gross morphological characters in *Glaucium flavum* so far as is possible from herbarium material alone, has led to a number of interesting conclusions.

1. There appear to be no sufficient reasons for retaining *G. leiocarpum*, *G. Serpieri*, *G. fulvum*, and *G. tricolor* as species distinct from *G. flavum*. They represent certain combinations of characters which occur also in other combinations and which show no clearly marked geographical or ecological isolation.

2. The occurrence of *G. Serpieri*, on ground from which old mining débris had been cleared, cannot be considered as proof that the seeds had remained dormant 1500–2000 years in the soil, covered by the accumulation of scoriae resulting from slave labour in classic times, since it comes within the variation range of a species common in countries bordering the Aegean. Heldreich (l.c. and Atti Congr. Intern. Bot. Firenze, 136 : 1874) gives no evidence which can be accepted as proof of such dormancy. The matter is discussed with reference to *Silene subconica* (*S. juvenalis*) in Kew Bull. 1933, 40.

3. *G. leiocarpum* (with which *G. Serpieri* must be closely associated) is a name which has been applied to plants of the Eastern Mediterranean Region with slender, relatively short, glabrous fruits and darker flowers. In other characters the material from Asia Minor and elsewhere shows as great a range of variation as is found in

western European *G. flavum*. Moreover, the fruit characters are not entirely clear-cut and oriental plants approximating to *G. flavum* in fruit characters and western plants approximating to *G. leiocarpum* have been examined. It seems most reasonable to place *G. leiocarpum* as a variation of *G. flavum* insufficiently isolated to deserve specific rank.

4. Accepting *G. flavum* in the suggested wide sense it becomes clear that the species is most polymorphic in the Eastern Mediterranean Region, and especially in the Balkan Peninsula, that it spread westwards and in doing so *G. flavum* sensu stricto (*Chelidonium Glaucium* L.) segregated out. Such a segregation involved the relative purification of the population so far as fruit characters were concerned, or, in other words, the population came to consist of a smaller and slightly different set of biotypes characterized by longer and broader fruits, yellow flowers, and adaptation to coastal conditions.

Eastwards from the Balkan Peninsula a selection, apparently less complete, has tended to the predominance of shorter, more slender, glabrous fruits and darker flowers. Plants showing these last characters can be designated *G. flavum* Crantz var. *leiocarpum* (Kuntze, pro parte) Stoy. et Stef. Flor. Bulg. i. 471 (1924).

5. A scheme for comparing plants showing different character combinations within a polymorphic species has been applied with considerable success to herbarium material. It is hoped that the method will be tested by other systematists over a wide range of species and genera.

6. *G. corniculatum* Curt., *G. arabicum* Fresen., *G. grandiflorum* Boiss. et Huet, *G. Haussknechtii* Bornm. et Fedde, *G. aleppicum* Boiss. et Husskn., *G. fimbrilligerum* Boiss., *G. squamigerum* Kar. et Kir., *G. pulchrum* Stapf, *G. elegans* Fisch. et Mey., *G. contortuplicatum* Boiss. and *G. cappadocicum* Boiss. are considered to be specifically distinct from *G. flavum* without prejudice to their relationship one to another. *G. calycinum* Boiss., *G. oxylobum* Boiss. et Buhse, and *G. acutidentatum* Hauskn. et Bornm. may be only variations within *G. flavum*, but the material available is at present not complete enough to justify their definite reduction. No specimens or insufficient material has been seen of *G. caricum* Stapf, *G. quadratifolium* Fedde, *G. vitellinum* Boiss. et Buhse, *G. paucilobum* Freyn, *G. insigne* Popow, and *G. refractum* Nábelek.

XXIII—DECADES KEWENSES. PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATARUM. DECAS CXXIX.

1281. **Medinilla gratiosa** *Stapf* [Melastomaceae]; *M. Curtisii* Hook. f. proxima, sed foliis petiolatis basi haud cordatis, floribus maioribus circiter 25 mm. diametro, petalis leviter roseo-suffusis, antheris albidis vel subflavidis distincta.

Frutex epiphyticus, humilis, glaberrimus, ramis pendulis cylindraceis modice lenticellatis. *Folia* opposita, petiolo crassiusculo 5–8 mm. longo suffulta; lamina late oblongo-lanceolata vel oblanceolata, basi subobtusa, apice breviter acuminata, circiter 10 cm. longa, 4 cm. lata, carnosula, facie obscure viridis, dorso pallida, triplinervis, nervorum iugo 8–10 mm. supra basin orto. *Cymae* 3–2-florae in paniculam pendulam laxiusculam pedunculo 3 cm. longo insidentem collectae; bracteae minutissime vel obscurae; pedicelli ad 4 mm. longi. *Receptaculum* obconicum, albidum, 8 mm. longum, apice 6 mm. diametro. *Calyx* annularis, truncatus, apiculis 5 minutis virescentibus notatus. *Petala* 5, late obovata, superne subundulata, 12 mm. longa, 9 mm. lata, alba leviter roseo suffusa. *Stamina* 10, aequalia; filamenta flavescentia, 6 mm. longa; antherae albidae vel subflavidae, incurvae, 6–7 mm. longae, connectivo antice bilobo, lobis aureis. *Ovarium* ope septorum 10 fere a basi receptaculo adhaerens, apice roseo.

MALAY PENINSULA. Fraser Hill, on the Phaang-Selangor frontier (3° 42′N., 101° 44′ E.), at about 1300–1400 m.; introduced to the Royal Botanic Gardens, Kew, from the Botanic Gardens at Singapore in 1929.

1282. **Erica (Evanthe) Fourcadei** *L. Bolus* [Ericaceae]; ab *E. glandulosa* Thunb., foliis vix pilis glanduliferis onustis, adultis saepe ovalibus coriaceis supra glabris nitentibusque, pedunculis longioribus saepe ad 1 cm. longis, sepalis saepius brevioribus 5–6 mm. longis, differt.

Rami visi rigidi, ad 25 cm. longi, ad 5 mm. diam. *Folia* adulta adscendentia vel demum patentia, parce ciliata, ad 1 cm. longa, ad 5 mm., vel marginibus valde revolutis 2 mm. lata. *Pedunculi* rarius ad 1·2 cm. longi. *Bracteae* 2 approximatae, tertia medio, vel supra medium, posita. *Corolla* saepissime omnino glabra, bucciniformis, 2·5–3·2 cm. longa cum segmentis rotundato-deltoideis ad 2 mm. longis. *Antherae* infra medium insertae, aristis minutis de filamento decurrentibus.

SOUTH AFRICA. Knysna Div.; Plettenberg Bay, 500 ft., Sept. 1926, *J. Phillips* (Forest Research Station, no. 1115); Humansdorp Div.; near Witte Els Bosch, among rocks of the seashore, *H. G. Fourcade* 2975 (type).

1283. **Erica (Pseuderemia) Holtii** *Schweickerdt*, sp. nov. [Ericaceae]; *E. Solandrae* Andr. affinis, sed pilis glanduloso-capitatis differt.

Suffrutex diffusus. *Rami* fere 20 cm. longi, tenues et debiles, rubro-fulvi et glanduloso-pilosi. *Folia* 2–4-nata, 2–4 mm. longa, linearia, sulcata, apice in pilum glanduloso-capitatum producta, glanduloso-pilosa. *Capitula* subglobosa, diversiflora. *Pedicelli* fere 2·5 mm. longi. *Bracteae* sepalis fere aequales aut breviores. *Sepala* 3 mm. longa, linearia, apice subacuta, glanduloso-pilosa. *Corolla* 4 mm. longa, alba, extra et intra glabra; tubus ovato-urceolatus vel urceolatus, fauce constricta ; lobi rotundati, leviter patuli, circiter 1 mm. longi. *Stamina* inclusa ; antherae aristatae ; aristae subulatae, minute puberulae, thecis aequalibus. *Ovarium* villosum ; stylus inclusus vel exertus ; stigma capitellatum.

South Africa. Transvaal : Lydenburg distr. ; Kemps Heights, March, *Holt* 226 (and *in National Herb.* 12461).

1284. **Erica (Arsace) Keetii** *L. Bolus* [Ericaceae] ; ab *E. copiosa* foliis glabris, corolla urceolari majore, stylo incluso, differt.

Erecta, ad 60 cm. alta. *Rami* graciles, floriferi 28 cm. longi ; ramuli copiosissimi, saepe 1–2·5 cm., ultimi 5 mm., longi. *Folia* 3-nata, fere erecta, imbricata, anguste sulcata, suboblonga, subobtusa, parce ciliata, ad 2 mm. longa cum petiolo 0·5 mm. *Flores* 3-nati. *Pedunculi* pubescentes, 2 mm. longi. *Bracteae* superiores 1 mm. longae, supra medium, tertia prope medium, positae, 1·25 mm. longae. *Sepala* pallide rosea, inferne scariosa, ciliataque, superne lateraliter compressa sulcataque, 1·75 mm. longa, ad 1 mm. lata. *Corolla* globoso-urceolata, sepalis impressa, 3 mm. longa cum lobis obtuse deltoideis 1 mm. longis. *Filamenta* complanata ; antherae ultra tubum partim exsertae, suboblongae, obtusae, poro dimidium lobi aequante, aristis longe ciliatis lobo aequilongis. *Discus* conspicuus. *Ovarium* breviter obconicum, superne pilosum, pilis erectis ; stylus superne ampliatus, staminibus parum brevior ; stigma capitatum.

South Africa. Knysna Div. ; Kaffir Kop, 1000 ft., Sept. 1921, *J. D. Keet* (Botanical Survey of S. Africa) 777. " Stiff sour veld soil, along road only, associated with *E. formosa*, not common."

1285. **Erica (Didymanthera) leucosiphon** *L. Bolus* [Ericaceae] ; ab *E. primulina* Bolus, foliis glabris, pedunculis longioribus, bracteis remotioribus, sepalis latioribus, differt.

Erecta, rigida, ut videtur ad 20 cm. alta. *Rami* atrati, ad 5 mm. diam. ; ramuli floriferi tomentosi, saepius ad 2 cm., rarius 3·5 cm., longi. *Folia* fere erecta, dense imbricata, 3-nata, linearia, acuta, angustissime sulcata, inferne ciliata, 4–6 mm. longa cum petiolo 1·5 mm. *Flores* 3-nati vel rarius 1–2-nati, saepe cernui, glabri. *Pedunculi* tomentosi, 0·6–1·3 cm. longi. *Bracteae* albae, subchartaceae, late ovatae, inferior 3–4 mm. longa, medio, superiores parum supra, positae, ad 5 mm. longae. *Sepala* erecta, concava, ovato-orbicularia, alba, ad 6·5 mm. longa, ad 5 mm. lata, interiora angustiora. *Corolla* alba, superne leviter ampliata, faucibus vix constrictis, 1·6–2·3 cm. longa cum segmentis rotundatis ad 2 mm. *Antherae* inclusae, lineares, subacutae, ad 3 mm. longae, lobis ad basin distinctis parallelis vel leviter divergentibus, anguste breviterque cristatae, poro dimidium lobi aequante. *Ovarium* subturbinatum, 4-loculare, sat profunde 8-lobatum, glabrum ; stylus demum per 2 mm. exsertus, superne ampliatus ; stigma capitellatum.

SOUTH AFRICA. Ceres Div.? obtained at the Ceres Wild Flower Show, Sept. 1924, *Marloth* 6223; Cape Town Wild Flower Show, *Bolus Herbarium*, No. 19,253 (type).

1286. **Symplocos subolivacea** *W. R. Price* [Symplocaceae]; *S. sinuatae* Brand affinis, sed foliis coriaceis acutis, costis supra impressis, spicis multifloris differt.

Arbor 3-metralis; ramuli glabri, annotini subteretes, griseo-brunnei, hornotini obtuse angulati, olivaceo-brunnei. *Folia* coriacea, oblongo-lanceolata, acuta, basi late cuneata, minute denticulata praesertim supra medium, denticulis fere ad glandulas redactis, 10–14 cm. longa, 3·5–4·5 cm. lata, glaberrima, supra brunneo-olivacea, subtus pallidiora olivaceo-viridia, costa supra impressa, subtus elevata, nervis utrinsecus 7–10 elevatis; petioli canaliculati, 1–1·5 cm. longi. *Spicae* axillares, plerumque basi ramosae, multiflorae, densae, 2 cm. longae, 2·5 cm. latae, axibus bracteis bracteolisque hirsutis; bracteae et bracteolae ovatae, acutae, 2–4 mm. longae, 1–2 mm. latae. *Flores* glabri. Calyx 4-lobus, 2·5 mm. longus, 2 mm. latus, lobis late ovatis obtusis 1 mm. longis 1·25 mm. latis. *Corolla* 4 mm. longa, alba, tubo brevissimo, lobis 5 oblongo-ovatis acutis 3 mm. longis 1·75 mm. latis demum patentibus. *Stamina* circiter 25, pentadelphia, corollam paullo excedentia, 5 mm. longa, filamentis filiformibus glabris, antheris subglobosis. *Ovarium* dense villosum; stylus glaber, 3·5 mm. longus, stamina subaequans. *Bacca* cum calyce persistente obpyriformis, 5·5 mm. longa, 4 mm. diametro, glabra.

CHINA. Western Fukien: top of pass between Lung-yen and Eng-hok, 900 m., Sept. 22, 1912, *W. R. Price* 1142.

1287. **Caralluma tessellata** *Pillans* [Asclepiadaceae]; affinis *C. Hottentotorum* N. E. Br. sed caulibus espinosis facile distinguitur.

Caules erecti, basi decumbentes, interdum procumbentes, usque ad 1 dm. alti, 1–1·3 cm. lati, plerumque plus minusve curvati, basi parce ramosi, subcylindrici, longitudinaliter sulcati, obtusissime 6-angulati, angulis sulcis transversis in areolas 4-vel 6-angulatas subprominentes divisis, unaquaque areola folio rudimentario papilliformi minuto instructa, glabri, viridissimi, obscure cineraceo-maculati. *Fasciculi* 2–5-flori, e sulcis longitudinalibus prope apices caulium orti. *Flores* singulatim vel plures simul expansi. *Pedicelli* adscendentes, 4–5 mm. longi, glabri. *Sepala* 2 mm. longa, ovato-lanceolata, acuta, glabra. *Corolla* 8–9 mm. diametro, extra glabra, lobis 3–4 mm. longis leviter reflexis apice recurvatis ovatis acutis supra convexis purpureis praeter apices marginesque papillis breviter aristatis instructis. *Discus* circiter 1 mm. latus, convexus, ciliis brevibus papilliformibus instructus, pallide viridis, purpureo-maculatus. *Tubus* circiter 1 mm. longus, ore 2 mm. lato intus levi ciliis paucis papilliformibus praedito. *Corona exterior* circiter 1 mm. alta, 2 mm. lata, cupuliformis, vitellina, lobis erecto-patentibus transverse oblongis profunde emarginatis, dentibus obtusis vel rarius acutis, sinibus obtusis. *Coronae interioris* lobi circiter 1 mm. longi, lineari-oblongi, obtusi, vitellini, antheris incumbentes, leviter recurvati.

SOUITH AFRICA. Van Rhynsdorp Div.; near road between Zout River and Nieuwerust, *P. Ross Frames* in Nat. Bot. Gardens, Kirstenbosch, 198/31.

1288. **Quercus lodicosa** *E. F. Warburg* [Cupuliferae]; affinis *Q. lanatae* D. Don, quae differt foliis latioribus minus acutis, nervis paucioribus (9-14), dentibus paucioribus grossioribus, cupulis multo minoribus minus crassis, glandibus tomentosioribus.

Arbor 15–20 m. alta. *Ramuli hornotini* dense lanati, lana dilute rubiginosa, *annotini* glabri, griseo-brunnei, lenticellis inconspicuis. *Stipulae* ovatae, usque 4 mm. longae, brunneae, membranaceae. *Foliorum laminae* ellipticae vel ovato-ellipticae, basi subinaequales, cuneatae vel leviter rotundatae, apice acutae et breviter acuminatae, 7–14 cm. longae, 3–5 cm. latae, serratae (basi per 2–3 cm. integrae), nervis utrinque 14–18 curvatis in dentes desinentibus; juniores utrinque dense lanatae, lana dilute rubiginosa, adultae supra glabrae (costa basi interdum excepta), nervis leviter impressis, subtus dense lanatae, lana dilute rubiginosa, nervis glabris prominentibus (costa basi tomentosa). *Petioli* 1–2 cm. longi, tomentosi, demum fere glabri. *Amenta mascula* circiter 4·5 cm. longa, rhachi involucrisque tomentosis, antheris leviter exsertis. *Flores feminei* 1–3, subsessiles, involucro tomentoso, stylis linearibus. *Fructus* (unicus) sessilis, *Cupula* patelliformis, 2–2·5 cm. diametro, 2 mm. crassa, intus rufo-tomentosa, squamis ovatis tomentosis crassis confertis laxe adpressis. *Glans* (forma ignota) apice leviter tomentosa.

S. E. TIBET. In forest along the ridge above Gompo Ne, Tsangpo Gorge, at 6000 ft., Dec. 19th, 1924, *F. K. Ward* 635 (type).

N. E. UPPER BURMA. Htawgaw Bum, north of Htawgaw (26° 10′ N., 98° 25′ E.), 7000–8000 ft., June 1924, *Forrest* 24,554; mixed forests (26° 23′ N., 98° 48′ E.), 10,000 ft., Nov. 1924, *Forrest* 25,405; mixed forests (26° N., 98° 25′ E.), 8000 ft., May 1925, *Forrest* 26,611 (from which the flowers are described).

1289. **Quercus suchiensis** *E. F. Warburg* [Cupuliferae]; a plerisque speciebus seriei (*Reticulatae*) cupulae squamis adpressis basi incrassatis, foliis majoribus differt. Inter species foliis magnis insignes, *Q. innuncupata* Trel. foliis ellipticis vel obovato-oblongis, *Q. conglomerata* Trel. et *Q. decipiens* Mart. et Gal. cupulae squamis tenuibus laxis, *Q. Purpusii* Trel. foliis minoribus, cupulis majoribus solitariis, *Q. rhodophlebia* Trel. squamis tenuibus vel carinatis, foliis minoribus nervis dilute rubris costa glabrescente, differunt.

Arbor. *Ramuli* dilute brunnei, leviter sulcati, 4–5 mm. diametro, lenticellis prominentibus. *Gemmae* brunneae, ovoideae, pubescentes, 2×3 mm. *Folia* obovata, 10–17 cm. longa, 6–11 cm. lata, apice obtusissima, basi cordata vel subcordata, ? semipersistentia, parcissime nec profunde crenata, crenulis breviter mucronatis, nervis 8–10-jugis in plurimas venulas prope marginem divisis supra impressis subtus prominentibus, supra dilute viridia, costa leviter pubescente excepta glabra, subtus pallidiora, glauca, praecipue in nervis laxe rubiginoso-stellato-pubescentia. *Petioli* puberuli, 4–7 mm. longi, circiter 3 mm. lati, supra plani, subtus teretes. *Stipulae* caducae. *Flores* ingoti. *Fructus* anno primo maturacentes, sessiles, 1–3 ad extremitatem pedunculi conferti (2 vel 3 interdum aborti); pedunculi 5–13 cm. longi, 2–3 mm. diametro. *Cupulae* hemisphaericae, 1·5–1·7 cm. diametro, crassiusculae, intus dense pubescentes, squamulis dilute brunneis basi incrassatis pubescentibus apice subacutis glabris fuscioribus stricte adpressis. *Glans* ellipsoidea, 2–2·5 cm. longa, intus et extra glabra.

MEXICO. Suchi, on the borders of the states of Mexico and Michoacán, 3000 m., Feb. 1832, *R. Heatley.*

1290. **Tainia quadriloba** *Summerhayes* [Orchidaceae]; affinis *T. Dunnii* Rolfe, a qua statura majore, sepalis petalisque angustioribus, labelli ungue multo angustiore lobo intermedio valde retuso bilobulo distinguitur.

Herba terrestris, radicibus multis flexuosis pubescentibus. *Pseudobulbi* approximati, anguste cylindrici, sursum sensim angustati, 3–4 cm. longi, 5–9 mm. diametro, apice monophylli. *Folia* e petiolo circiter 4–5 cm. longo elliptico-lanceolata, acuta, basi angustata, 25–30 cm. longa, medio 3 cm. lata. *Scapus* e basi pseudobulbi ortus, erectus, 60–80 cm. altus, apice circiter 10-florus, inferne cataphyllis paucis vaginantibus instructus. *Racemus* 7–12 cm. longus; bracteae parvae, lanceolatae, acutae, reflexae, 3–5 mm. longae. *Flores* suberecti, flavi. *Sepala* et *petala* similia, falcatim lineari-ligulata, subacuta; sepalum intermedium 12–14 mm. longum, 1–1·25 mm. latum; sepala lateralia 9 mm. longa, 1·25 mm. lata; petala 12–13 mm. longa, 1·75 mm. lata. *Labellum* ex ungue anguste cuneato 3 mm. longo ambitu quadratum, quadrilobum (vel trilobum lobo intermedio bilobulo), totum 9 mm. longum, 6·5–7 mm. latum; lobi laterales ovato-triangulares, obtusi, 1·5 mm. longi; lobus intermedius bilobulus, 3 mm. longus, 5–5·5 mm. latus, lobulis oblique fere orbicularibus antice truncatis sinu rotundato sejunctis; labelli discus inferne carinis duabus satis altis laevibus superne carinis tribus humilibus apice paulo altioribus intermedio lateralibus paulo longiore fere usque ad apicem labelli instructus. *Columna* gracilis, incurvata, 6–6·5 mm. longa. *Pedicelli* cum ovario 1–1·5 cm. longi.

CHINA. Kwangtung, Lung Ta'u Shan, Iu village, in a ravine to left, growing on rock, May 29th, 1924, *Lingnan Univ. Herb.* (*To & Ts'ang*) 12,246.

A striking species, characterized chiefly by the very broad bilobed middle lobe of the lip, which thus appears almost equally 4-lobed. This specimen was kindly sent to Kew by Dr. Metcalf, of Lingnan University.

XXIV—ADDITIONS TO THE FLORA OF BORNEO AND OTHER MALAY ISLANDS : IV.* H. N. RIDLEY.

SAPINDACEAE.

Otophora latifolia *Ridley*, sp. nov. ; *O. erythrocalyci* Hiern affinis, sed foliis longioribus, floribus et fructibus multo minoribus, antheris sericeis differt.

Frutex vel arbor parva. *Folia* usque ad 7-jugata, petiolo 19 cm. longo glabro. *Foliola* alterna vel subopposita, subcoriacea, elliptico-lanceolata, breviter acuminata, basi cuneata, 35 cm. longa, 10 cm. lata ; nervi usque ad 6-pares, subtus elevati, nervi secundarii et reticulationes subtus conspicui ; petioluli crassi, transversim rugosi, 1 cm. longi. *Panicula* elongata, glabra, 37 cm. longa, rhachide obscure angulata, ramis strictis gracilibus, inferioribus 18 cm. longis. *Flores* parvi, glomerulati, plurimi, glabri. *Pedicelli* 3 mm. longi. *Sepala* 4, rotundata. *Petala* 4, obovata, multo minora. *Stamina* 8, antheris oblongis sericeis. *Pistillum* glabrum, oblongum, stigmate sessili. *Drupae* ellipticae, glabrae, subcomplanatae, 8 mm. longae. *Semina* 1 vel 2, ovoidea, 7 mm. longa.

BRITISH NORTH BORNEO. East Coast, *Creagh* (type) ; Sandakan, Myburgh Province, *Elmer* 20,138 ; and probably also Mt. Kalawat, *Mrs. Clemens* 11,175.

This plant, apparently confined to the Sandakan district of Eastern Borneo, is closely allied to *O. erythrocalyx* Hiern of the Malay Peninsula. The leaves, however, are very much longer than any I have seen of that species, the flowers and fruits are much smaller, and the anthers are silky.

Otophora macrocarpa *Ridley*, sp. nov. ; ab *O. erythrocalyce* Hiern, cui affinis, foliolis ferme sessilibus minoribus, panicula minore, floribus multo minoribus differt.

Frutex vel arbor parva. *Folia* 11-jugata, 30 cm. longa, rhachide hirta. *Foliola* alterna vel subopposita, lanceolata, acuminata, basi obliqua obtusa, 6–15 cm. longa, 3–4·5 cm. lata, costa subtus elevata parce hirta, nervis 7–8-paribus procul a margine inarcuantibus ; petioluli incrassati, nigri, hirti ; stipulae rotundatae, cordatae, 1 cm. longae. *Paniculae* ramosae, pubescentes, 15–30 cm. longae, ramis patentibus usque ad 20 cm. longis. *Flores* parvi, in glomerulos distantes congesti, pedunculis 2–3 mm. longis. *Sepala* 5, rotundata, glabra. *Petala* 5, multo minora, oblonga, basi hirta. *Stamina* 8, antheris oblongis marginibus albo-sericeis. *Pistillum* ovoideum, stigmate capitato. *Drupa* globosa, glabra, 3 cm. longa.

BORNEO : Sarawak, Kuching, *Haviland* 67 (type), 917, 1847, 2138.

Haviland describes this both as a shrub and as a small tree. It is a very floriferous species, with small flowers and a large, globular, smooth fruit.

---

*Continued from *K.B.* 1931, 499.

Nephelium glabrum *Bl.*

BORNEO. Sarawak, *Haviland & Hose* 3372.

This is not previously recorded from Borneo. It is common in the Malay Peninsula and Java.

Nephelium sufferrugineum *Radlk.*

BORNEO. Sarawak: near Kuching, *Haviland* 2194 and 2277: "flowers white."

This is also an addition to the Bornean flora. In the Flora of the Malay Peninsula I retained this plant as a variety of *N. glabrum* Bl., but it is clearly a good species, for the fruits collected by Haviland are totally unlike the smooth ones of that species, being covered with long, bristle-like processes with curved, not muricate, tips rising from dilated bases much like those of *N. lappaceum*, but the drupe is only 2 cm. long.

Nephelium obovatum *Ridley*, sp. nov.; foliis trifoliolatis, foliolis coriaceis obovatis, paniculis racemiformibus densifloris axillaribus ab omnibus congeneribus distinctum.

Arbor, ramis superne pubescentibus. *Folia* trifoliolata; petioli 2 cm. longi. *Foliola* obovata, apice rotundata, basi angustata, 5–8 cm. longa, 3·5–4 cm. lata, coriacea, supra glabra, reticulata, subtus in costis hirta, nervis subtus prominentibus 7-paribus; petioluli crassi, hirti, 3 mm. longi. *Paniculae* racemiformes, densiflorae, plures, axillares, 4·5 cm. longae, hirtae. *Bracteae* lanceolatae, acutae, hirtae. *Pedicelli* 1 mm. longi. *Calyx* cupulatus, lobis 5 triangularibus acutis hirtis. *Petala* 5, paullo minora, lanceolata. *Stamina* 8, filamentis gracilibus 3 mm. longis basi hirtis. *Ovarium* (*abortivum*) hirtum.

BORNEO. Sarawak: near Kuching, *Haviland* 2275: "Large tree, flowers sweet-scented."

I have seen only male flowers of this remarkable tree, which is very distinct from all others known in its trifoliolate leaves, with stiff, obovate leaflets, its short, dense panicles with very numerous flowers on very short branches, lanceolate petals and hairy ovary.

Nephelium Hosei *Ridley*, sp. nov.; a *N. costato* Hiern, cui affine, foliis tenuioribus glabris, sepalis subacutis nec rotundatis differt.

Arbor. *Folia* glabra, 30 cm. longa. *Foliola* 8, lanceolata, acuminata, 16 cm. longa, 5–5·5 cm. lata, basi inaequaliter cuneata, subcoriacea, nervis 14-paribus secundariis conspicuis tenuibus; petioluli 5 mm. longi. *Paniculae* elongatae, 30 cm. longae, pubescentes, ramis 15 cm. longis vel brevioribus. *Pedicelli* breves, 2 mm. longi. *Sepala* 5, ovata, subacuta vel rotundata, pubescentia. *Petala* nulla. *Stamina* 3 mm. longa, filamentis basi hirtis. *Discus* hirtus. *Drupae* oblongae, binae, 1·5 cm. longae, papillis conicis textae, in disco hirto insidentes, sepalis accrescentibus 3 mm. longis.

BORNEO. Sarawak: Baram, *Hose* 124 (type); Matang road woods, *Ridley*.

I believe that my plant from the Matang road woods is the same as Hose's plant, but it is in fruit only. The leaves are quite similar, but glaucous beneath, the panicle elongated and stouter, the pedicels short and stout, but the disc is hairy, as it is in Hose's specimen.

The species is very nearly allied to *N. costatum* Hiern of the Malay Peninsula, but the leaves are much thinner and the sepals are thicker, rounded and velvety. From *N. Beccarianum* Radlk. it differs in the hairy leaves and very hairy panicles, which are also much smaller.

Pometia alnifolia *Teysm.* *Irina alnifolia* Bl. and *I. tomentosa* Bl.

I cannot distinguish Blume's *Irina tomentosa* from his *I. alnifolia.* The difference he gives is that in *I. tomentosa* the leaves are more rounded and subcordate at the base than in *I. alnifolia*, but I find cuneate-based leaves along with round-based ones on the same plant. The tree, in fact, varies very much in foliage. It is sometimes quite glabrous, as in a co-type collected by Korthals in Sumatra, while in other specimens the branchlets and leaves are densely velvety-hairy. A tree I found on Mt. Matang, Sarawak, has leaves gradually narrowed to the base, but the petioles, costa on both sides and leaf rhachis are bristly-hairy. Haviland obtained, near Kuching (no. 2260), a form in which the leaflets are narrowed or rounded at the base and densely, softly tomentose beneath.

Paranephelium nitidum *King.*

BRITISH NORTH BORNEO. Balambangan island, *Wood* 1757: " A tree twenty-five feet tall, in forest,"

Not recorded from Borneo before. It occurs in Sumatra and the Malay Peninsula.

Mischocarpus sundaicus *Bl.*

BRITISH NORTH BORNEO. Sandakan, a stout form from the East Coast, *Creagh.*

This common plant has not before been recorded from Borneo.

Harpullia confusa *Bl.*

DUTCH BORNEO. Bangermasin, *Motley* 1143: " A large tree; flowers white."

This plant has been confused by Merrill and other botanists with the very different Indian shrub *H. cupanioides* Roxb. It is common in the Malay Peninsula and Java. *H. juglandifolia* Bl. seems to me to be the same plant.

Harpullia tomentosa *Ridley*, sp. nov.; ab *H. confusa* Bl., cui affinis, foliis et ramis velutinis, floribus masculis multo majoribus, petalis tenuibus spathulatis differt.

Arbor tomentosa. *Folia* 15 cm. longa, petiolis et rhachide velutinis. *Foliola* alterna, usque 8, lanceolata, apice abrupte acuminata, obtusa, basi obtusa, 10–12 cm. longa, 3·5–4 cm. lata, membranacea, supra glabra, subtus in nervis hirta, nervis 10–11-paribus subtus elevatis cum costa hirto-barbatis; petioluli 2 mm. longi,

hirti. *Paniculae masculae* breves, velutinae. *Pedicelli* 1·5 cm. longi, imbricati, velutini. *Sepala* 5, imbricata, elliptica, apice rotundata, 1 cm. longa, velutina. *Petala* 5, spathulata, basi linearia, hirta, apice sensim dilatata, 3 mm. lata. *Stamina* subaequilonga, antheris curvis oblongis. *Pistillodium* dense hirtum, disco circulari undulato pubescente. *Flores feminei* atque *fructus* non visi.

BORNEO. Sarawak: Mt. Braang, limestone, alt. 150 m., *Haviland* 2232.

Clearly allied to *H. confusa* Bl., but very distinct in the red, velvety pubescence of the inflorescence and branches. On the leaves the hairs are confined to the midrib and nerves. They are very numerous, pale, and close-set in tufts. The inflorescences in the only specimen are but 5 cm. long. Normally I expect they are longer. The flowers are much larger than those of *H. confusa* Bl., and their petals are nearly as big as those of *H. cupanioides* Roxb.

SABIACEAE.

Meliosma grandifolia Lecomte in Bull. Soc. Bot. Fr. liv. 676 (1909).

This name is antedated by Urban for a Mexican species (published 1895), so I propose the name **M. sarawakensis** *Ridley*, nom. nov., for the Bornean plant. It is not uncommon in SARAWAK: *Beccari* 3572; Rock Road, *Haviland* 742; Old Jungle Conglomerate, *Haviland* 763; Matang, *Ridley*. Haviland says that his No. 742 was a climber, but my plant was a tree, with red calyces and white petals. A specimen from Limbang (*Haviland* 787) has larger leaflets than usual, hairy on both sides, but apparently from a young plant.

Meliosma latifolia *Ridley*, sp. nov.; a *M. nitida* Bl., cui affinis, foliolis tenuioribus ovatis magnis, nervis et rhachide hirsutis, floribus hirtis distincta.

Arbor. Folia magna, rhachide rufo-velutina. *Foliola* ovata, acute acuminata, basi lata, brevissime inaequilateralia, acuta. 18–20 cm. longa, 7·5–10 cm. lata, supra glabra, nervis et costa exceptis, subtus nervis elevatis 8-paribus cum costa rufo-hirsutis; petioluli crassi, rufo-velutini, 1 cm. longi. *Panicula* 36 cm. longa (pedunculo 14 cm. longo incluso), ramis dissitis 5·5 cm. longis omnino rufo-hirtis. *Flores* sessiles. *Sepala* lanceolata, acuta, hirta. *Petala* ovata, hirta. *Stamina* 2, hirsuta. *Stylus* sepalis longior, glaber.

BORNEO. Sarawak: *Haviland & Hose* 3627.

A very distinct species in its large, broadly ovate leaflets, hairy on the nerves. The one specimen is incomplete, as there is only a portion of the large leaf with distinct leaflets, and the flowers are nearly over.

ANACARDIACEAE.

Rhus perakensis *King*.

BORNEO. Sarawak: near Bau and Kuching, *Haviland* 70, 1965; *Haviland & Hose* 3366; Baram, *Hose* 263: " Flowers green."

This plant has not previously been recorded for Borneo.

Mangifera odorata *Griff.*

BRITISH NORTH BORNEO. Marinsinsing, Marudu Bay, *Fraser* 256.

Mangifera foetida *Lour.*

BORNEO. Sarawak: *Beccari* 3564, 3565.

Mangifera longipes *Griff.*

BORNEO: Sarawak: *Beccari* 2655.

Mangifera sclerophylla *Hook. fil.*

BORNEO. Sarawak: near Kuching, *Haviland* 2079.

None of these species of *Mangifera* has been previously recorded for Borneo. The first two are commonly cultivated fruit trees and are doubtless carried about by Malays.

Mangifera Beccarii *Ridley*, sp. nov.; a *M. Griffithii* Hook. fil., cui affinis, foliis basi obtusis, panicula multo longiore et laxiore, ovario disco trilobo circumdato differt.

Arbor. Folia elliptica, obtuse cuspidata, glabra, basi rotundata, 7–10 cm. longa, 3–5 cm. lata, coriacea, costa crassa utraque pagina elevata, nervis 11-paribus subtus elevatis; petioli crassi, 1 cm. longi. *Paniculae* plures, terminales, puberulae, laxae, 22 cm. longae. *Flores* in glomerulos dissitos congesti. *Pedicelli* 2 mm. longi, pubescentes. *Sepala* 4, lanceolata, pubescentes. *Petala* 4, alba, linearia, glabra, 1 mm. longa. *Stamen* unicum. *Stylus* petalis aequilongus. *Discus* trilobus, lobis rotundatis cum petalis alternantibus.

BORNEO. Sarawak: *Beccari* 3079.

This is closely allied to *M. Griffithii* Hook. fil. of the Malay Peninsula, but differs in the leaf-bases being rounded, not cuneate, in the stronger elevated nerves and midrib, the long spreading panicle branches and in the three-lobed disc entirely surrounding the ovary.

Mangifera Havilandi *Ridley*, sp. nov.; *M. longipetiolatum* King approximat, sed paniculis brevibus compactis, foliis ellipticis minoribus, sepalis multo brevioribus, petalis angustioribus distincta.

Arbor glabra. *Folia* remota, elliptica, acute cuspidata (cuspide 1 cm. longa), basi acuminata, 10–15 cm. longa, 3·5–5·5 cm. lata, coriacea, nervis gracilibus 8–9-paribus, costa supra elevata subtus crassa elevata, reticulationibus parvis conspicuis; petioli graciles, 3–3·5 cm. longi. *Paniculae masculae* laxae, 9–10 cm. longae, ramis 4 cm. longis paucis dissitis glabris. *Pedicelli* graciles, 2 cm. longi. *Sepala* 4, ovata, acuminata, marginibus minute ciliatis. *Petala* 4, lanceolata, acuta, alba, 3 mm. longa. *Stamen* unicum, filamento cylindrico acuminato, anthera oblonga atra. *Discus* carnosus, circularis, lobulatus. *Flores feminei* non visi.

BORNEO. Sarawak: near Kuching, *Haviland & Hose* 3368: "Small tree; petals white; stamen one."

This is perhaps nearest to *M. longipetiolata* King, but the panicles are smaller and the pedicels shorter.

Buchanania fragrans *Ridley*, sp. nov.; a *B. splendente* Miq., cui affinis, paniculis densis, foliis brevioribus, sepalis ovatis obtusis, gynaecio hirto differt.

Arbor, ramulis novellis et perulis dense velutinis. *Folia* obovata, 11–14 cm. longa, 5·2–6 cm. lata, rigide coriacea, glabra, supra fusca, subtus castanea (siccitate), basi acuminata, nervis 10-paribus gracilibus elevatis; petioli crassiusculi, 1 cm. longi. *Paniculae* multiflorae, densae, foliis breviores, 6–12 cm. longae, ramis 2–3 cm. longis rhachidibus pubescentibus. *Flores* albi, fragrantes. *Pedicelli* 1 mm. longi, pubescentes. *Sepala* glabra, ovata, obtusa. *Petala* oblonga, obtusa, 2 mm. longa. *Stamina* 8, filamentis linearibus petalis brevioribus, antheris terminalibus oblongo-ovatis glabris. *Discus* cupuliformis, 10-lobus. *Carpella* 5, hirta.

BORNEO. Sarawak: near Kuching, *Haviland* 1659: "Tree; flowers white, somewhat scented."

var. **oblanceolata** *Ridley*, var. nov. foliis tenuioribus oblanceolatis basi longe acuminatis apice breviter acuminatis 12–18 cm. longis 4·5–5 cm. longis, paniculis densis 9–12 cm. longis.

BORNEO. Sarawak: near Kuching, *Haviland* 903: "Small tree; flowers white, disc ten-lobed, carpels 4 or 5, one only ovule-bearing."

This variety closely resembles the type in every point but the leaves. The species is apparently most nearly allied to *B. splendens* Miq. (of which, however, I have seen no specimens), but differs in its dense panicle and hairy ovary.

Buchanania glaberrima *Ridley*, sp. nov.; *B. arborescenti* Bl. affinis sed omnino glaberrima, pedicellis longioribus, calycis lobis brevioribus.

Arbor, omnino glabra. *Folia* obovata, obtusa vel rotundata, basi in petiolos decurrentia, 8–11 cm. longa, 3–6 cm. lata, rigide coriacea, nitida, nervis 9-paribus utrinque elevatis tenuibus, secundariis et reticulationibus conspicuis elevatis; petioli basi incrassati, transversim rugosi, 1 cm. longi. *Paniculae* 10 cm. longae, glabrae, ramis 1–1·5 cm. longis. *Pedicelli* 2–3 mm. longi. *Sepala* brevia, rotundata. *Petala* oblonga, obtusa, 2 mm. longa. *Stamina* 10, filamentis linearibus apice acuminatis 1 mm. longis, antheris oblongis sagittatis. *Discus* cupuliformis, margine obscure denticulatus. *Carpella* 3–4, glabra.

BORNEO. Labuan, *Creagh.*

This species is perhaps nearest to *B. arborescens* Bl., but is completely glabrous.

Buchanania aruensis *Ridley*, sp. nov.; a *B. molli* Lauterb., cui affinis, foliis oblanceolatis laminis ad bases petiolorum decurrentibus differt.

Arbor, ramis novellis validis dense molliter hirtis. *Folia* oblanceolata, laminis ad bases petiolorum decurrentibus, apice breviter (5 mm.) acute cuspidata, 18–20 cm. longa, 5·5–7 cm. lata, subcoriacea, supra glabra, subtus nervis 20-paribus cum costa et reticulationibus hirtis; petioli dorso velutino-hirti, 1·5 cm. longi. *Paniculae* 9 cm. longae, dense hirtae. *Pedicelli* 1 mm. longi, hirti. *Sepala* ovata, acuta, dorso hirta, 1 mm. longa. *Petala* glabra, 2 mm. longa, lineari-oblonga. *Staminum* filamenta filiformia, glabra, antheris oblongis longe sagittatis. *Discus* brevis, glaber, undulatus. *Carpella* 3–4, basi dense hirta.

ARU ISLANDS. Giabu-Lengan, 1873, *Beccari*.

This tree appears to be nearest to *B. mollis* Lauterb., of New Guinea, of which I have been unable to see a specimen. The foliage of *B. aruensis*, however, is totally different, the oblanceolate lamina of the leaves being decurrent to the base of the petiole.

Gluta laxiflora *Ridley*, sp. nov.; a *G. elegante* Hook. fil., cui affinis, foliis longioribus angustioribus, nervis subtus elevatis, panicula laxiflora, floribus minoribus minute puberulis, gynophoro multo breviore differt.

Arbor glabra. *Folia* lanceolata vel oblongo-lanceolata, cuspidato-acuminata, basi angustata, 13–20 cm. longa, 3·5–5 cm. lata, coriacea, nervis 17-paribus subtus elevatis; petioli 3 cm. longi, graciles, basi 1 cm. incrassati. *Panicula* laxa, pauciflora, 10 cm. longa, ramis gracilibus puberulis. *Pedicelli* 4 mm. longi. *Calyx* spathaceus, bilobus, 4 mm. longus, lobis obtusis. *Petala* 9 mm. longa, oblongo-linearia, apice recurva, dorso puberula. *Stamina* paullo longiora, filamentis gracilibus subaequilongis. *Ovarium* oblongo-globosum, gynophoro 2 mm. longo.

BORNEO. Sarawak: Baram river, *Hose* 185.

This is undoubtedly allied to *G. elegans* Hook. fil., of Penang Hill, but differs in the longer, narrower leaves with strongly elevated nerves beneath, in the smaller flowers, and in the branches of the panicle, the calyx, and the backs of the petals being minutely scurfy-puberulous.

Melanorrhoea tricolor *Ridley*, sp. nov.; a *M. aptera* King, cui affinis, foliis multo minoribus petiolatis nervis paucioribus, petalis ferme glabris nec sericeo-velutinis differt.

Arbor magna, glabra. *Folia* obovata, apice rotundata, basi acuminata, 7–11 cm. longa, 4–5 cm. lata, rigide coriacea, costa nervisque 12-paribus subtus elevatis reticulationibus minutis conspicuis; petioli 2·5 cm. longi, basi incrassati. *Racemi* validi, 11–13 cm. longi. *Flores* majusculi, dissiti. *Pedicelli* validi, 2 cm. longi. *Alabastra* elliptico-ovoidea, 1 cm. longa. *Calyx* calyptratim deciduus, flavus. *Petala* oblanceolata, obtusa, extra sericea, 1·2 cm. longa, 4 mm. lata, alba. *Stamina* plurima, rosea, 1 cm. longa, filamentis gracilibus sericeis. *Gynophorum* 4 mm. longum. *Ovarium* parvum, subglobosum, stylo 5 mm. longo. *Drupa* immatura obovoidea (petalis deciduis).

BORNEO. Sarawak: near Kuching, *Haviland* 2231: "Large tree; calyx yellow, petals white, pink at the base, stamens pink."

Allied to *M. aptera* King, but the leaves are much smaller, not sessile, and have many fewer nerves, and the petals are only thinly silky outside.

Melanorrhoea speciosa *Ridley*, sp. nov.; a *M. tricolori* Ridl., cui affinis, floribus paniculatis, foliis subtus et inflorescentia hirtis differt.

Arbor magna, ramis hirtis. *Folia* obovata, apice lata, rotundata, emarginata, basi acuta, 7–9 cm. longa, 4–6·5 cm. lata, valde coriacea, supra glabra, subtus costa nervisque 15-paribus elevatis hirtis albescentibus; petioli crassi, hirti, 2 cm. longi. *Paniculae* validae, hirtae, pauciramosae, 18 cm. longae, ramis 3–6 cm. longis. *Flores* majusculi. *Pedicelli* hirti, 1 cm. longi. *Alabastra* conico-ellipsoidea, 1 cm. longa. *Calyx* calyptratim deciduus, hirtus. *Petala* oblonga, obtusa, alba, basi rubra, extra sericeo-hirta, 1·4 cm. longa, 4 mm. lata. *Stamina* plura, rosea, filamentis hirtis 1 cm. longis. *Ovarium* sericeo-hirtum, gynophoro 4 mm. longo.

BORNEO. Sarawak: near Kuching, *Haviland* 3147: "Large tree; petals white, base red, stamens pink."

This resembles *M. tricolor* Ridl., but is very hairy, and the flowers are arranged in panicles and not in simple racemes.

Nothopegia borneënsis *Ridley*, sp. nov.; nulli speciei arcte affinis, foliis majusculis ellipticis crassis, paniculis axillaribus glabris, floribus globosis parvis distincta.

Arbor. Folia elliptica vel oblanceolato-elliptica, brevissime et obtuse cuspidata, basi obtusa vel rotundata, 11–14 cm. longa, 5–6 cm. lata, coriacea, supra glabra, costa obscure puberula excepta, nervis 21-paribus parallelis elevatis, reticulationibus subtus crassis elevatis puberulis; petioli 2 cm. longi, incrassati, hirti. *Paniculae* plures, axillares, graciles, parce et breviter ramosae, pubescentes, hirtae, 5–8 cm. longae. *Bracteae* 2 mm. longae, lanceolatae, hirtae. *Flores* sessiles, globosi, 2 mm. longi. *Calyx* globosus, lobis 4 ovatis acutis. *Petala* vix longiora, ovata, acuta, intus hirta. *Stamina* minuta. *Ovarium* hirtum.

BORNEO. Sarawak: *Beccari* 241.

I take this to be a species of *Nothopegia* as it has the characteristic foliage and inflorescence. The interior of the small flowers is hairy, as is the ovary. The foliage is quite like that of *Melanochyla*, the inflorescence nearly glabrous and the petals short and rounded. The genus has not been previously recorded from Borneo, the other species being natives of India and Ceylon.

Campnosperma squamatum *Ridley*, sp. nov.; a *C. auriculato* Hook. fil., cui affine, foliis minoribus conspicue reticulatis, panicula racemiformi squamis tecta differt.

Arbor. Folia lanceolata, obtusa, basi angustata, 10–14 cm. longa, 4–5·5 cm. lata, nervis 13-paribus tenuibus paullo elevatis, reticulationibus parvis conspicuis; petioli 1–2 cm. longi, supra canaliculati, basi auriculati. *Paniculae* racemiformes, squamatae, 12 cm. longae, ramis 2 mm. longis vel brevioribus. *Flores* parvi, sessiles. *Calyx* 4-lobatus, lobis brevibus rotundatis. *Petala* ovata, subacuta, 1 mm. longa. *Stamina* 9, subaequilonga, filamentis linearibus. *Ovarii* rudimentum in disco magno immersum.

BORNEO. Sarawak: near Kuching, *Haviland & Hose* 3196.

This species has much smaller leaves than most, and they are conspicuously reticulate; the blade is decurrent to the base of the petiole, where it is auricled. The almost simple inflorescences are covered with minute round scales.

Melanochyla axillaris *Ridley*, sp. nov.; nulli speciei arcte affinis; paniculis brevibus compactis multifloris axillaribus glabrescentibus, calyce obconico puberulo nec lanuginoso ab omnibus congeneribus distincta.

Arbor parva. *Folia* alterna, oblanceolata, obtusa, basi angustata, 22–45 cm. longa, 6–12 cm. lata, valde coriacea, glabra, nervis 21-paribus subtus elevatis subparallelis, reticulationibus subtus conspicuis; petioli validi, 4–6 cm. longi, basi (2–3 cm. longa) valde incrassati, angulati, rufo-velutini. *Paniculae* axillares, densae, multiflorae, 2 cm. longae, ramis puberulis. *Bracteae* 2 mm. longae, lanceolatae, dense hirtae. *Pedicelli* 1 mm. longi, puberuli. *Calyx* gamosepalus, obconicus, 5 mm. longus, purpureo-puberulus, lobis 5 triangularibus acutis. *Petala* 5, lineari-oblonga, utrinque hirta, calyci adnata. *Stamina* 5, alterna breviora, filamentis hirtis, antheris parvis terminalibus. *Ovarium* globosum, hirtum, stylo breviusculo terminali.

BORNEO. Sarawak: near Kuching, *Haviland* 994, 2211, 2284; "Small tree; sepals purple."

This is very different from any other described species in the very short, dense, crowded, axillary panicles which are nearly glabrous. The obconic calyx is longer than in most species and nearly glabrous. The young fruit in one specimen is ovoid, acute and densely red-velvety-hairy.

Melanocommia *Ridley*, gen. nov.; inter *Melanochylam* et *Semecarpum* intermedia, calyce parvo cupulato 5-dentato, petalis liberis extra hirtis, staminibus 5 extra discum 10-dentatum liberis, ovario hirto uniloculari, ovulo singulo laterali, stylis 3 elongatis recurvis stigmatibus cordatis ab utroque genere distat.

Melanocommia borneënsis *Ridley*, sp. nov. (adhuc unica).

Arbor ferrugineo-velutina. *Folia* alterna, elliptica, acuta, basi paullo angustata, 15 cm. longa, 7·5 cm. lata, coriacea, nervis subtus elevatis rufo-hirtis 10-paribus; petioli crassi, 1 cm. longi, rufo-velutini. *Panicula* terminalis, 5 cm. longa, rufo-velutina, ramis 2 cm.

longis. *Bracteae* lanceolatae, obtusae, hirtae. *Calyx* brevis, patelliformis, breviter 5-dentatus, hirtus. *Petala* 5, valvata, triangularia, extra hirta, 5 mm. longa, subacuta. *Stamina* 5, ovario breviora, glabra, extra discum brevem 10-crenatum orta, antheris ovato-cordatis. *Ovarium* globosum, hirtum, uniloculare. *Ovulum* 1, e basi lateraliter enatum, funiculo longo curvato, micropyla infera. *Styli* 3, nutantes, glabri. *Stigmata* biloba.

BORNEO. Sarawak : *Beccari* 3151.

This plant seems intermediate between *Melanochyla* and *Semecarpus*. It has quite the habit of the former, but has a very short corolla and three long styles. The flowers are as big as those of a *Melanochyla*, but the stamens are free to the base and outside the disc, and the three styles more resemble those of *Semecarpus*.

Semecarpus rufo-velutinus *Ridley*, sp. nov. ; *S. velutino* King affinis, sed foliis minoribus ovatis, panicula longiore et laxiore, petalis oblongis multo majoribus distinctus.

Arbor rufo-velutina. *Folia* ovata vel oblonga, cuspidato-acuta, basi obtusa, 14–23 cm. longa, 7–11 cm. lata, coriacea, supra glabra, subtus nervis 18-paribus et costa rufo-hirtis ; petioli crassiusculi, 1·2 cm. longi, rufo-velutini. *Paniculae* rufo-velutinae, 29 cm. longae, laxae, multiramosae. *Flores* in glomerulos congesti, sessiles vel brevissime pedicellati. *Bracteae* 1 mm. longae, rufo-hirtae. *Calyx* cupularis, 1 mm. longus, dense hirtus, lobis vix distinctis obtusis. *Petala* oblonga, obtusa, puberula, 2 mm. longa. *Stamina* petalis duplo breviora, antheris conicis majusculis. *Discus* et *ovarium* hirta.

BORNEO. Sarawak : Miri river, *Hose* 652 (type) ; *Beccari* 3724.

Semecarpus lanceolatus *Ridley*, sp. nov. ; *S. albescenti* Kurz affinis, foliis lanceolatis acuminatis, floribus majoribus distinctus.

Arbor, ramis velutino-hirtis. *Folia* lanceolata, breviter acuta, basi acuminata, 18–21 cm. longa, 3–5 cm. lata, subcoriacea, supra glabra, subtus nervis 18-paribus hirtis elevatis, costa crassiuscula elevata ; petioli 1–1·4 cm. longi, incrassati. *Paniculae* laxae, 30 cm. longae, velutinae, ramis dissitis patentibus 11 cm. longis. *Flores* vel singuli vel pauci in glomerulos dispositi, pedicellis hirtis 2 cm. longis. *Calyx* obconicus, hirtus, lobis triangularibus acutis 1 mm. longis. *Petala* 5, lanceolata, acuta, 2 mm. longa, extra sericea. *Stamina* multo breviora. *Ovarium* globosum, hirtum.

BRITISH NORTH BORNEO. Tawan, East Coast, tree near beach, *Creagh*.

Pentaspadon teleianthera *Ridley*, sp. nov. ; a *P. Motleyi* Hook. fil., cui affinis, staminibus omnibus antheriferis, calyce multo minore et petalis vix imbricatis valde distinctus.

Arbor. *Foliola* 3-juga : juniora lanceolata, acuminata, basi subacuta ; adulta non visa. *Paniculae* subterminales, pubescentes, 15–21 cm. longae, ramulis dissitis. *Flores* albi, pedicellis gracilibus hirtis 2 mm. longis. *Bracteae* lanceolatae, hirtae. *Calycis* lobi

breves, ovati, acuti, hirti. *Petala* 5, paullum imbricata, oblonga, obtusa, 2 mm. longa. *Stamina* 10, omnia antherifera, filamentis teretibus 2 mm. longis, antheris oblongis. *Discus* brevis, patelliformis, 10-lobus. *Ovarium* glabrum. *Stylus* crassus, sublateralis, stigmate apice cristato.

BORNEO. Sarawak: Kuching, *Haviland* 2871.

This species differs from *P. Motleyi* Hook. fil., the type species of the genus, in the longer pedicels and very short calyx, but more especially in the fact that all the stamens are antheriferous and apparently fertile, instead of five being abortive. The petals only just overlap at their edges and are not so distinctly imbricate as in the other species. In all other respects it so closely resembles the type species that it is impossible to separate it generically. As it flowers when the leaves are just returning after the leaf-fall, I have seen no adult foliage.

Parishia borneënsis *Ridley*, sp. nov.; a *P. insigni* Hook. fil., cui affinis, floribus multo majoribus, sepalis petalisque latis rotundatis, panicula valida, petiolulis brevissimis differt.

Arbor. *Folia* glabra, 18 cm. longa. *Foliola* 9, oblongo-lanceolata subcordata, 7·5–9·4 cm. longa, 4 cm. lata, coriacea, nervis 12-paribus tenuibus utrinque elevatis, reticulationibus conspicuis; petioluli brevissimi, 3 mm. longi. *Paniculae* plures, 30 cm. longae, rufo-hirtae. *Bracteae* lanceolatae, obtusae, velutino-hirtae. *Flores masculi* pedicellati, pedicellis 4 mm. longis hirtis. *Calyx* 3 mm. longus, cupulatus, hirtus, lobis 4 lanceolatis. *Petala* 4, vix aequilonga, glabra, rotundata, obovata. *Stamina* 4, filamentis crassiusculis linearibus, antheris conicis. *Flores feminei* et *fructus* non visi.

BORNEO. Sarawak: near Kuching, *Haviland* 2274: "Tree, male, stamens usually 4."

I have seen only an imperfect leaf of this tree and more fully developed ones may be larger. As is usual in this genus, the tree is unisexual and this specimen was male.

Parishia polycarpa *Ridley*, sp. nov.; a *P. insigni* Hook. fil., cui affinis, fructibus vix duplo minoribus ochraceo-pilosis distincta.

Arbor parva. *Folia* 18 cm. longa, rhachidibus glabris. *Foliola* 7, opposita, oblongo-elliptica, breviter acuminata, basi rotundata, 10 cm. longa, 4 cm. lata, coriacea, nervis usque 15-paribus tenuibus inconspicuis parallelis, reticulationibus minutis conspicuis; petioluli crassi, rugosi, 1 cm. longi. *Flores* non visi. *Panicula fructescens* valida, 20 cm. longa, ramis 5 cm. longis parce ochraceo-tomentosis. *Fructus* globosi, 1 cm. longi, alis sepalinis oblongo-linearibus apice rotundatis dense adpresse ochraceo-pilosis 5 cm. longis 1 cm. latis.

BORNEO. Sarawak: Bergark, 1600 ft., limestone, 4 Jan. 1889, *Haviland* 113: "Small tree."

This species is remarkable for its rigid, coriaceous leaves with numerous faint, parallel nerves and conspicuous but minute reticulations, and for its yellowish-hairy fruit.

Parishia minor *Ridley*, sp. nov.; *P. polycarpae* Ridl. affinis, sed foliolis multo minoribus rigidis lanceolatis, alis sepalinis angustis obtusis distincta.

Arbor parva. *Foliorum rhachides* graciles, glabrae. *Foliola* 11, opposita, lanceolata vel oblongo-lanceolata, obtuse acuminata, apice rotundata vel retusa, basi breviter obtuse cuneata, 5–7 cm. longa, 2 cm. lata, glabra, rigide coriacea, nervis tenuibus paullum elevatis parallelis 11-paribus supra inconspicuis, reticulationibus inconspicuis laxis. *Flores* non visi. *Panicula fructescens* 26 cm. longa, validula, ramis 7–15 cm. longis hirtis, ramulis 4 mm. longis dense hirtis. *Drupae* 1·3 cm. longae, ovoideae; alae sepalinae 4, tenues, lineares, obtusae, 7 cm. longae, 4 mm. latae, juniores pubescentes, adultae glabrae, nervis elevatis pluribus parallelis, venulis anastomosantibus.

BORNEO. Sarawak: near Kuching, *Omar* 368.

This tree is distinct in the very narrow, blunt leaflets, which are small for the genus.

The label mounted with the specimen and number states that the plant is a tree of 20 feet, with a sweet, edible fruit, and that the native name is *Nyatoh Pipit*. This name is Malay for a *Bassia* sp.: it is therefore possible that the label has been misplaced.

Parishia sericea *Ridley*, sp. nov.; a *P. Maingayi* Hook. fil., cui affinis, floribus minoribus sericeo-velutinis, foliolis subovatis nec oblongis differt.

Arbor. *Folia* glabra, 45 cm. longa; petioli 14 cm. longi. *Foliola* 15, subopposita, ovato-oblonga, obtuse acuminata, basi rotundata, 8·5–10 cm. longa, 4·1–5·2 cm. lata, coriacea, glabra, nervis primariis 15-paribus tenuibus elevatis, secundariis parallelis tenuioribus; petioluli crassiusculi, canaliculati et transversim rugosi, 1 cm. longi. *Panicula* laxa, multiflora, 40 cm. longa, dense velutino-hirta, siccitate flavescens. *Bracteae* lanceolatae, sericeo-velutinae. *Flores* subsessiles, alabastris globosis sericeo-velutinis. *Calyx* campanulatus, 3 mm. longus, sericeus, lobis 4 brevibus ovatis obtusis. *Petala* linearia, 4 mm. longa, obtusa, glabra. *Stamina* 4, glabra, filamentis crassiusculis teretibus. *Discus* et *pistillodium* hirta.

BORNEO. Sarawak: near Kuching, *Haviland* 2273.

Parishia Lowei *Ridley*, sp. nov.; a *P. pubescente* Hook. fil., cui affinis, inflorescentia parce hirta, floribus minoribus, sepalis pubescentibus, foliolorum nervis paucioribus, reticulationibus subtus elevatis differt.

Arbor. *Folia* usque 7-foliolata, rhachide hirtula. *Foliola* oblonga, obtusa vel subacuta, basi rotundata, subcordata, 8–10 cm. longa, 4–4·5 cm. lata, coriacea, supra glabra, subtus hirta, nervis 13-paribus supra depressis subtus elevatis crassiusculis dense hirtis; petioluli breves vel subnulli. *Paniculae* pauciramosae, hirtulae, 30 cm. longae, ramis 5 cm. longis vel brevioribus. *Flores masculi* pauci, pedicellis gracilibus 4 mm. longis pubescentibus. *Calyx* breviter campanulatus, pubescens, 2 mm. longus, lobis 4 lanceolatis. *Petala* 4, lanceolata, aequilonga, glabra. *Stamina* 4, filamentis filiformibus, antheris oblongis. *Flores feminei* non visi.

BORNEO. "Kayu Upik," *Lowe.*

Dracontomelum sylvestre *Bl.*

BORNEO. Sarawak: Kuching, *Haviland* 2751; Rejang Sibu, *Haviland* 2272, 2544; Sarawak river, above Lidah Tana, *Haviland*, "bzld," sine num.; Saribas River, *Haviland* 3182; without precise locality, *Beccari* 923, 2783 and 3518. Dutch Borneo: *Korthals*; Bangermasin, *Motley* 350 (referred by Engler to *D. mangiferum* Bl.): "Second-rate tree; flowers greenish."

This is the commonest species of the genus in Borneo.

Dracontomelum Cumingianum *Baill.*

BORNEO. Sarawak: on Mt. Matang, Jan. 1915, *Ridley.*

A common Philippine plant, new to Borneo.

Dracontomelum brachyphyllum *Ridley*, sp. nov.; a *D. sylvestre* Bl., cui affine, foliolis multo minoribus coriaceis, nervis procul a margine inarcuantibus, panicula brevi et rhachide cum foliorum costa atque petiolulis hirtis, differt.

Arbor, ramulis novellis ferrugineo-velutinis. *Folia* brevia, 25 cm. longa, rhachide hirta. *Foliola* 15, subopposita, oblonga, longe acuminata, basi rotundata, inaequilateralia, 5–9 cm. longa, 2–2·5 cm. lata, coriacea, supra nitida, glabra (costa puberula excepta), reticulationibus conspicuis elevatis, subtus pallidiora, nitida, costa praesertim basi hirta, ceterum glabra, nervis 8-paribus subtus elevatis 2 mm. a margine inarcuantibus; petioluli crassi, hirti, 2 mm. longi. *Paniculae* 20 cm. longae, ramis dissitis 2–5 cm. longis furfuraceo-puberulis, pedicellis gracilibus 3 mm. longis. *Sepala* 5, ovata, obtusa, 4 mm. longa, dorso furfuracea. *Petala* 5, linearia, glabra, 6 mm. longa. *Stamina* 10, filamentis filiformibus, antheris oblongis. *Discus* tomentosus, obscure crenulatus. *Carpella* 5, ad basin connata. *Ovula* 5, pendula, cylindrico-canaliculata. *Stigma* capitatum, 5-lobum.

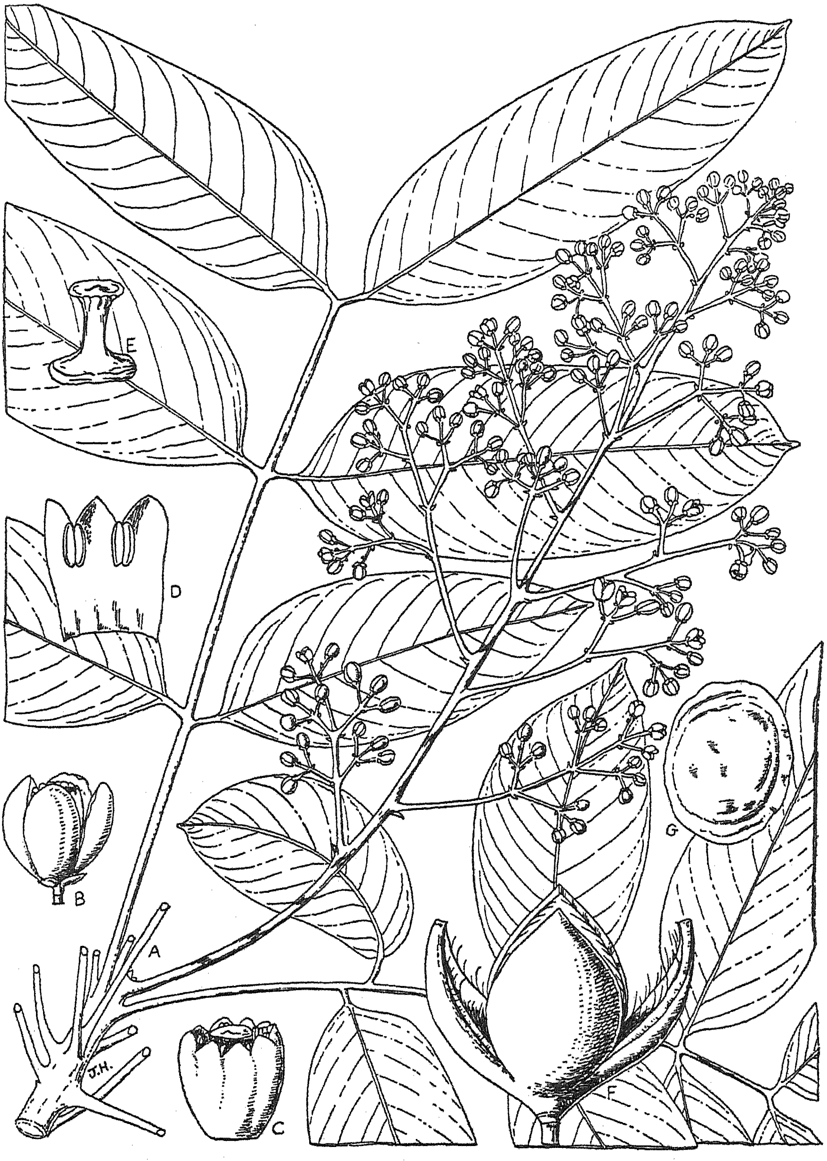
BORNEO. Sarawak: near Kuching, *Haviland* 2272.

A very distinct species in its small, stiff leaflets; hairy rhachis, petiolules and underside of midrib; the lax, short panicle; and short petals compared to the sepals.

XXV—CENTRAL AFRICAN CANOES.

In the *Kew Bulletin* 1931, 414, an account was given by Mr. C. M. Harris of the construction of canoes used by the natives on Lake Victoria, Uganda.

Now, through the courtesy of Mr. J. E. Hughes, for many years a resident in north-eastern Rhodesia, we have been privileged to extract from the mss. of his book ("Eighteen Years on Lake



Khaya nyasica Stapf. A, Flowering shoot with number of inflorescences removed (× ½); B, Flower (× 4); C, Staminal tube (× 6); D, Portion of same from inside (× 6); E, Pistil (× 6); F, Fruit (× ½); G, Seed (× ¾).

Bangweolo," *The Field*, 1933) a description of the construction of the native dug-outs used on Lake Bangueolo, an extensive but very shallow lake in the heart of the Brachystegia country. Mr. Hughes forwarded to Kew leaflets, seeds and a small sample of the timber of the tree used for making the canoes, and known locally as "Mofu," and Mr. Hutchinson was able to identify these as belonging to *Khaya nyasica* Stapf, of the family *Meliaceae*. The genus *Khaya* produces some of the well-known West African Mahoganies, such as *K. anthotheca* C. DC., *K. grandifoliola* C. DC., *K. ivorensis* A. Chev., and *K. senegalensis* A. Juss. The last mentioned is perhaps now regarded as of the least economic importance, but it is the most closely allied to *K. nyasica* Stapf. *K. senegalensis* has a wide range in Northern Tropical Africa, occurring mostly in open woods by streams from the French Sudan in Upper Guinea to the French Cameroons, and extending through the Shari eastwards to the Sudan and Uganda. Its leaflets are oblong, usually acute and equal-sided at the base, mostly quite rounded at the apex, and somewhat rigidly leathery in texture in the dry state. *K. nyasica* occurs in the Katanga region of the Belgian Congo, through north-eastern Rhodesia, around Lake Nyasa and south to the Melsetter district of Eastern Rhodesia. Its leaflets are from ovate to oblong, rounded and mostly very unequal-sided at the base, and always abruptly acuminate and thin in texture.

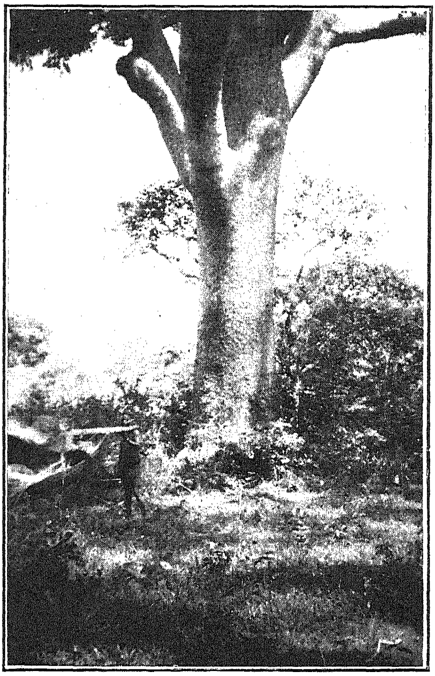
A black and white drawing of the species is given, and photographs by Mr. Hughes are reproduced showing the tree and construction of the canoes in various stages. Mr. Hughes' account has been condensed as follows :—

"The finest tree of the forest is the 'Mofu' (the plural of which is 'Myofu'). A good specimen usually has a trunk running straight upwards without branches, in some cases up to fifty feet high. The wood is cross-grained and pinkish when freshly cut, turning into a dark brown after a few days' sunshine. The bark is smooth, and the leaf and seeds are similar to those of an ash. Each seed has a vane for flying like that of the ash.

"The wood of the 'Mofu' is good timber, and is used for making the largest dug-out canoes. It is also very suitable for furniture. The Kyambi Mission of the White Fathers is almost entirely furnished with this wood, the trees being very plentiful in that neighbourhood where they are called 'Mwali.'

"The natives are very superstitious about this tree, and will not touch it, or even approach it, until a special 'Singanga' (Medicine Man) has been provided, to kill, with strong medicine, the evil spirit supposed to inhabit the tree. At an old village near Sokontwi there was on a high part of a plateau overlooking the Luapula a splendid solitary 'Mofu' towering above the forest, a landmark for miles. A gang of twenty men refused to approach it closely. I was desirous of converting it into a canoe. Incidentally, this tree was bristling with spears and arrows discharged at it from a distance, and left sticking

PLATE XII



" Mofu " tree, *Khaya nyasica* Stapf.

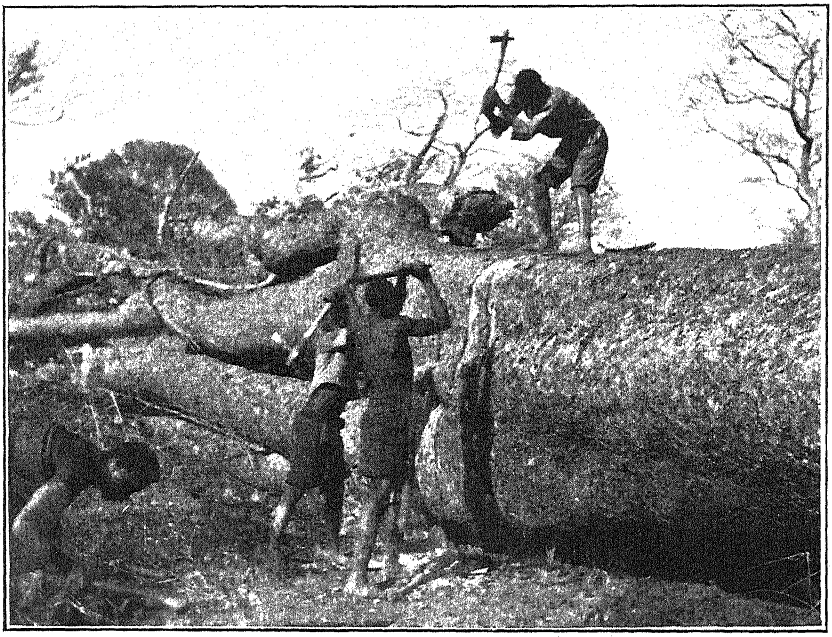
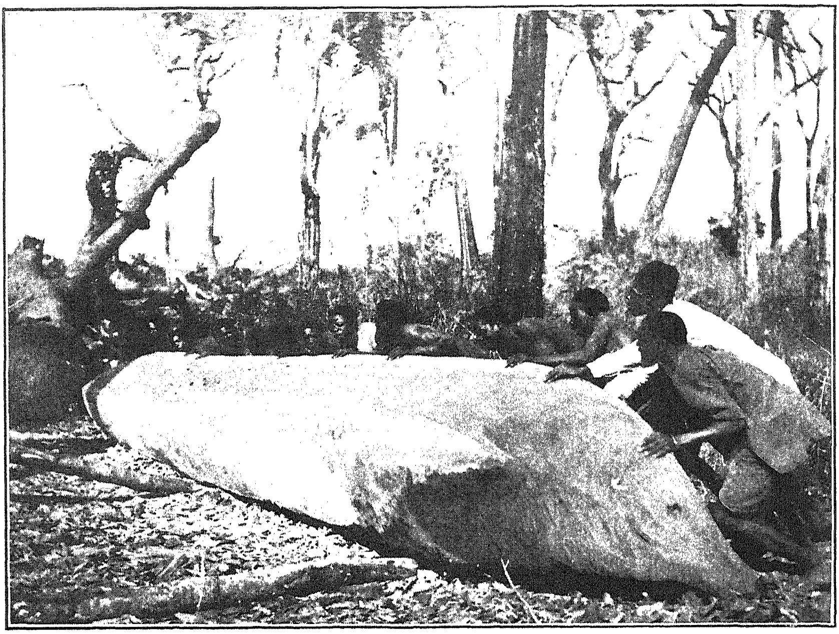
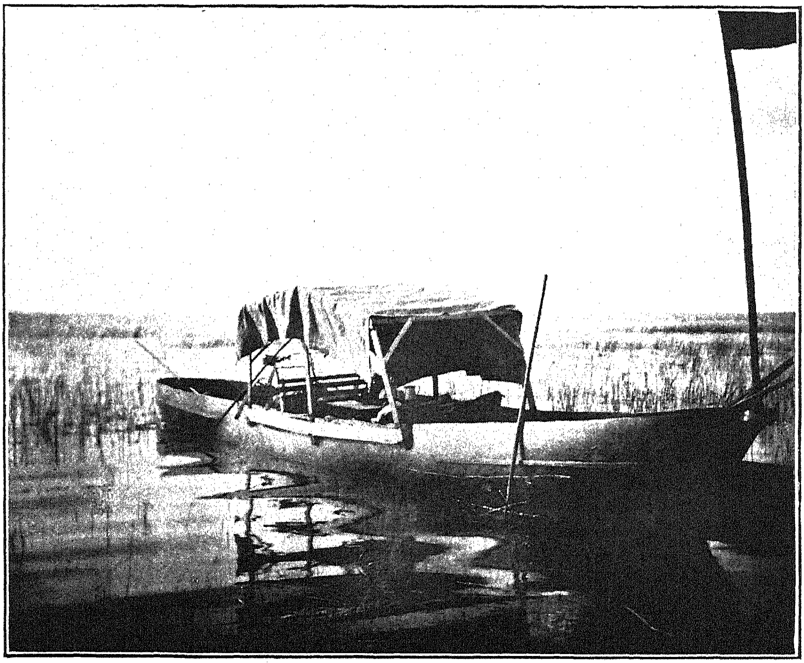


PLATE XIII



Turning over a half-hewn canoe.



" Miloki " canoe, a graceful native dug-out made from the " Mofu " tree.

in the bark all round the trunk. I took an axe and walked right round the tree, chopping into it here and there ; it did no good. All they said was that I should die in a few days, and departed to their villages to await the arrival of a Medicine Man. One can understand the superstitious fear these ignorant savages have of the magnificent 'Myofu.' They are very impressive, looking up from right under their branches they seem to scrape the clouds ; the swaying makes one feel quite dizzy. Fortunately, they will never become extinct, since those with crooked or forked trunks, being unsuitable for canoe-making, are left to propagate.

"It was not until I had obtained the services of a Medicine Man from the Lake, a plausible amusing scamp, but a good man at canoe making, that I got this fine tree dug up by the roots and fashioned into a very fine dug-out which was christened 'Nkolakalango' after the Chieftainess, who is a relative of the Sokontwi (Ngomba). A second canoe was fashioned out of the arms and called 'Kaputula,' because for some reason or other it had to be cut off.

"The cutting of a really big canoe is quite a formidable, but at the same time, diverting undertaking. The whole thing is looked upon as a regular dry weather picnic.

"A circular trench is dug right round the tree, four or five feet away from the trunk, the roots being hacked through as the trench sinks until about 6–7 feet deep ; then an ominous crack, and a gentle leaning of the tree gives warning that the end is near.

"Now, all with the exception of one man—a volunteer and an expert—retire from the trench. He stands on the last root to be severed and then leaps out of danger as the grand tree sways forward to earth with a mighty crash, in which many of the great upper boughs are smashed.

"Five men were detailed to cut through the neck which stood fully 6 feet high (see photograph) and well above their heads, as will be seen. Others were detailed to chop away the massive roots, aiming to leave a blunt-pointed trunk which would eventually become the prow end of the canoe. All the rest of the gang were spread out along both sides, and on the top of the trunk, to cut away the bark and the soft white sapwood which in the case of the 'Mofu' is almost negligible, the 'Mofu' being practically all heart right to the bark.

"The hollowing out of the tree is all done by axes. 'Semba' is the name of the axe as used for chopping. When the blade is put in crosswise it is called 'Mbaswa'—the ingenious native thus makes one tool do the whole job. Fire in any shape or form is not used in the process. Parallel transverse cuts about a foot apart are made, and then the wood between them is split out in large pieces. The sides and bottom of such a large canoe are left of great thickness, not less than 9 or 10 inches. Then the canoe is turned upside down and the work of shaping it is undertaken. The skilled men direct the others how to shape the sides and top, while they themselves carve out the prow and the stem, which is important work and not to be entrusted to anyone else. The fashioning of the outside of the canoe is carried very nearly to completion, taking a week or ten days, during which the constant ' tappa-tappa-tappa-tap-tap ' of the axes resounding on the hollow trunk now acting as a huge drum begins to get on one's nerves.

" When this work is completed no more can be done for at least six months—if cut thinner at this juncture the wood would warp and crack and the canoe would be spoiled. It has now to be turned upright again and must be kept filled with water during the seasoning period, whilst the sides are draped with grass or weeds to ward off the blaze of the sun.

" It is necessary to make arrangements with the nearest local headman to see that the canoe is kept filled with water up to the brim, for which a small payment is made.

" After sufficient seasoning the canoe is turned over again and the inside is more completely hollowed out. The Fundes gauge the thickness by putting one hand inside the canoe and the other on the outside opposite and clapping their two hands together with the wood between. Owing to long practice they are able to estimate the thickness of the wood with surprising accuracy.

" The canoe, although not yet completely finished, is ready to be dragged down to the nearest water, sometimes taking several days. The passage of a great dugout leaves a cleared road noticeable for a few years."

XXVI—NORTHEA HORNEI OR N. SEYCHELLANA.

T. A. SPRAGUE AND M. L. GREEN.

These two names were based on the same type-specimen, namely *Horne* 539. This was described by Baker (Fl. Maurit. & Seychelles, 194), in 1877, in the following words : " The *Capucin* of the Seychelles (Horne, 539), is probably a sixth unnamed species of this genus [*Sideroxylon*], but I have not seen flowers. It is a tree 50–60 feet high, with very stout conspicuously nodose branchlets, stout flattened petioles $\frac{1}{4}$–$\frac{1}{2}$ in. long, oblong obtuse very thick coriaceous leaves 5–9 inches long glabrous and shining above, ferrugineo-puberulent below, with many close distinct veins (not more than $\frac{1}{12}$ in. apart), spreading from the costa nearly at a right angle and remaining visible to the edge."

Two years later, Hartog (Journ. Bot. 1879, 358), gave the name *Mimusops Hornei* to Horne's specimen, but supplied no description : " I may here mention that a dissection of the very young buds on a specimen of the ' *Capucine* ' of the Seychelles prove it to be not a *Sideroxylon*, but a 3-merous *Mimusops*. As the petals were so young as to be still exstipulate, I could not determine the section. I name it, therefore, *M. Hornei*, after its collector, Mr. Horne, to whom systematic botany owes so many prizes. Full descriptions of the new species referred to in this paper will shortly be published in the 'Journal'." Hartog, however, did not publish the promised description, and in 1884 the species was re-named *Northea seychellana*, gen. et sp. nov., by J. D. Hooker (Hook. Ic. Pl. t. 1473).

Hooker cited the name proposed by Hartog as "*Mimusops? Horneana* Hartog in Journ. Bot. 1879, 358 (name only)." Hartog, however, had published it as "*M. Hornei*," and expressed no doubt as to the genus.

In 1890, Pierre (Not. Bot. Sapot. 11), proposed the new combination *Northea Hornei* (Hartog) Pierre, based on *Mimusops Hornei*.

Engler (Engl. & Prantl, Nat. Pflanzenfam. iv. Abt. 1, 153: 1891), adopted the name *Northea seychellana* Hook. f., but subsequent authors, including Hemsley (Journ. Bot. 1916, 361), Diels (Beitr. Kenntn. Veg. Seych. 455: 1922) and Summerhayes (Trans. Linn. Soc., Zool. xix. 282: 1931), called it *N. Hornei*.

The question now arises which is the correct name, *N. seychellana* or *N. Hornei*. *Mimusops Hornei* Hartog appeared without a description: Hartog merely mentioned that it was 3-merous. A description of the same specimen (*Horne* 539), however, had been given previously by Baker (Fl. Maurit. & Seych. 194: 1877), who stated that it probably was a *Sideroxylon*. Hartog, however, did not refer to this description, nor can we find any evidence that he had seen it. It is not even certain that Hartog knew of Baker's Flora of Mauritius and the Seychelles. It is true that the last sentence of Hartog's paper (l.c. 359) dealing with stipules, contains a reference to observations on Sapotaceae by Baker: "Their presence varies from species to species in such natural genera as (*Eu-*) *Mimusops* and *Sideroxylon*, as noticed by Baker." This, however, cannot refer to Baker's flora, as there he (l.c. 191) describes the leaves of Sapotaceae as exstipulate. We have not been able to trace the reference.

Under the International Rules of Nomenclature, the name of a taxonomic group is not validly published unless it is accompanied by a description of the group, or by a reference to a previous description of it. Hartog neither described *Mimusops Hornei* nor referred to any previous description, hence the name *M. Hornei* was not validly published, and the species concerned should be called *Northea seychellana* Hook. f.

The spelling of the generic name (*Northea* or *Northia*) calls for notice. J. D. Hooker (Hook. Ic. Pl. xv. 57), spelled it with an "e" in the only two places in which it occurs in the text. On the plate (t. 1473), however, it was spelled with an "i." Otto Kuntze (Post & Kuntze, Lexic. 391: 1903) adopted the intrinsically preferable form *Northia*, but other authors accepted the original spelling *Northea*, which must be retained in the absence of proof that it was a typographic or an unintentional orthographic error.

XXVII—MISCELLANEOUS NOTE.

Boyce Thompson Southwestern Arboretum.—We have recently received an illustrated booklet describing the purpose, history and dedication of this Arboretum. It was founded and endowed by Colonel Boyce Thompson (the founder of the Institute for Plant Research at Yonkers) for the purpose of " bringing together and growing, for study and possible utilization, the plants of sub-arid climates, and of publishing the results of such investigations." The construction of the Arboretum was commenced in 1924, and Professor Franklin J. Crider, the present Director, took up his duties in the autumn of that year. In 1927 the Articles of Incorporation were signed, and in 1929, after the death of the founder, the dedication and official opening took place in the presence of a large gathering of botanists.

The Arboretum consists of about 1130 acres, situated near the town of Superior, Arizona. The most conspicuous features are Picket Post Mountain, 4400 feet, and two canyons traversing the grounds from east to west. There is a great variety of exposures and soils, " the whole supporting a great diversity of native vegetation and furnishing an especially interesting and favourable natural setting for the institution."

There are two large structures for the propagation of plants, built in 1925, and an Administration Building, including offices, laboratories, herbarium, library and other rooms, which was erected in 1926. In 1928 the founder gave his winter home, Picket Post House, to the Arboretum for the use of Students as living quarters. The Arboretum, therefore, is very well equipped for both cultural work and study in the herbarium and laboratory, and, by reason of its situation in an exceedingly dry climate, enjoys together with the Desert Laboratory of the Carnegie Institution of Washington at Tucson, exceptional opportunities for the study of the vegetation of sub-arid regions.

Printed under the authority of His Majesty's Stationery Office,
By The South Essex Recorders, Ltd., High Road, Ilford.

(158) Wt. 92/35 925 5/33 S.E.R. Ltd: Gp. 9.

BULLETIN OF MISCELLANEOUS INFORMATION No. 5 1933
ROYAL BOTANIC GARDENS, KEW

XXVIII—NOTES ON THE TRINIDAD AND TOBAGO SPECIES OF LAURACEAE.

R. L. Brooks (Deputy Conservator of Forests, Trinidad).

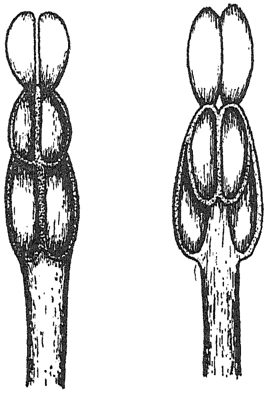
This family, known as the " Lauriers " in Trinidad, is of considerable interest to the Forest Officer, on account both of its economic value as providing useful soft woods and of its general prevalence. Considerable confusion prevails locally with regard to the native names, several species on the one hand being given the same name, and more than one name on the other hand being given to a single species; again a species having one name in the north of the island may have a different name in the south. The standardization of the local nomenclature is therefore desirable. With regard to scientific nomenclature, there is no more recent botanical account than that contained in Mez's monograph on the American Lauraceae (1889), and this publication (in the Jahrbuch des königlichen botanischen Gartens) is not generally accessible; further, since the publication of this work, many additional species have been found, some of which are new to science.

The present investigation has been carried out at the Imperial Forestry Institute, Oxford, and in Trinidad. The writer is deeply indebted to the Director of the Royal Botanic Gardens, Kew, for the loan of the Trinidad specimens in the Kew Herbarium, and of types from elsewhere, and to Mr. N. Y. Sandwith of the Herbarium staff, both for the trouble he has taken in selecting the material and for various notes based on his experience of the West Indian flora, which materially helped to avoid confusion and error. The writer wishes, also, to record his grateful thanks to Dr. Burtt Davy, Lecturer in Tropical Forest Botany at the Imperial Forestry Institute, for his very necessary direction, control and supervision of this paper, and to Mr. A. C. Hoyle, Demonstrator in Botany at the Imperial Forestry Institute, who checked the descriptions of the species; also to the Sherardian Professor of Botany for the loan of books from the Oxford Botanic Gardens Library; and finally to Mr. R. O. Williams, Economic Botanist of Trinidad and Tobago, for considerable assistance with the Trinidad Herbarium specimens.

This investigation, carried out mainly on herbarium material, has emphasized the necessity for more field work on this difficult family. Many of the specimens in herbaria are incomplete, representing only one sex, and the range and variations in leaf size, shape and nervation require careful study. Until, however, an investigation has been made of the types of the species recorded, there can be no background for field work.

Ocotea arenaensis is a new species, and *Phoebe elongata* vars. *elliptica* and *elongata* are two new varieties, published here for the first time.

Note.—* in the text denotes introduced species. Unless otherwise stated, the specimens cited are in the Herbarium at Trinidad. "*T.H.*" following a number of a specimen indicates that the number is that of the Trinidad Herbarium and not of the collector whose name precedes the number.



Stamens of *Phoebe* (left, × 40), and *Persea* (right, × 32), showing the difference in the arrangement of the locules.

KEY TO THE GENERA OF TRINIDAD LAURACEAE.

a. Trees or shrubs, *b.*
  b. Anthers 2-locular, *c.*
    c. Two outer rows of stamens perfect (in the Trinidad species); innermost row (staminodia) large, foliaceous.......1. *Aiouea.*
    c. Three outer rows of stamens perfect; innermost row (staminodia) abortive or stipitiform.................2. *Aniba.*
  b. Anthers 4-locular; perfect stamens 9; fruiting perianth enlarged or more or less unchanged, *d.*
    d. Leaves tripli- or subtriplinerved, *e.*
      e. Leaves opposite.............................3. *Cinnamomum.*
      e. Leaves alternate, *f.*
        f. Leaves glandular in nerve axils.........3. *Cinnamomum.*
        f. Leaves eglandular in nerve axils...............7. *Phoebe.*
    d. Leaves penninerved, *g.*
      g. Fruiting perianth enlarged; perianth segments deciduous, *h.*
        h. Anther locules superimposed in pairs..........4. *Ocotea.*
        h. Anther locules spreading into a bow in a single row. 5. *Nectandra.*

g. Fruiting perianth tube only slightly enlarged, *i.*

i. Perianth segments deciduous; lower locules of the anthers touching the upper at their side (see figure)...... 6. *Persea.*

i. Perianth segments persistent; lower locules of the anthers touching the upper at their base (see figure) 7. *Phoebe.*

a. Stems twining, filiform, aphyllous.................... 8. *Cassytha.*

1. Aiouea *Aubl.* Pl. Guian. i. 310, t. 120 (1775).

Tree. Leaves glabrous, shining, coriaceous, penninerved. *Flowers* hermaphrodite. *Panicles* axillary or subterminal, loose. *Perianth-tube* ovoid or subcampanulate, segments 6, subequal. *Perfect stamens* 6, those of the first and second series (more rarely those of first series only) with short or fairly long eglandular filaments and 2-locular introrse anthers. *Staminodes* of the third series narrow with 2 large glands at the base, more rarely imperfectly 1–2-locular towards the apex; staminodes of the fourth series ovate-triangular subsessile or more rarely 0. *Ovary* included in the perianth-tube; style more or less exserted. *Fruit* a berry, ovoid or oblong, seated on the pedicel which is thickened, usually obconical, and crowned with the hardened remains of the perianth.

Key to Species.

a. Pedicels and perianth puberulous; pedicels 2–3 mm. long. 1. *densiflora.*

a. Pedicels and perianth glabrous; pedicels 3·5–7 mm. long; perianth glaucescent when dry.................... 2. *Schomburgkii.*

1. **Aiouea densiflora** *Nees* in Linnaea, xxi. 513 (1848).

Tree. Branchlets early glabrescent: leaves 12–23 cm. long, 3·5–8 cm. broad, oblong or elliptic-oblong to elliptic-ovate, coriaceous, glabrous on both surfaces; above shining with mid-rib prominent and primary nerves elevated, veins flat or slightly impressed, not very conspicuous; beneath nerves prominent and veins prominulous; apex usually subacutely or bluntly acuminate, more rarely obtuse, base cuneate; petiole up to 2·5 cm. long, channelled : panicles up to 13 cm. long, mostly shorter than or subequal to the subtending leaves, glabrescent : pedicels 2–3 mm. long, longer than the flowers : calyx 1·5 mm. diam. : fruit an ovoid berry about 14 mm. long and 13 mm. diam. seated on the enlarged obconical pedicel, which is about 8 mm. diam. at apex, crowned with the hardened remains of the perianth.

TRINIDAD: locality and collector unknown, 631 *T.H.*!; Latria, near Merrimac, 29 April, 1865, collector not stated, 2732 *T.H.*!; Mayaro, fruiting, March, *Broadway*, 12208 *T.H.*!; Arena Reserve, *Brooks*, 12556 *T.H.*!; Southern Watershed Reserve, *Russell*, 12598 *T.H.*!

Local name (Siparia); *Laurier canelle.*

The type is from Guiana.

2. **Aiouea Schomburgkii** *Meissn.* in DC. Prodr. xv. pt. 1, 82 (1864).

Tree. Branchlets glabrous: leaves up to 24 cm. long, 7 cm. broad, elliptic, oblong-elliptic, or elliptic-obovate, thinly coriaceous, both surfaces glabrous; nerves and veins prominulous on both surfaces, reticulation lax; apex caudate- or shortly and bluntly acuminate, base cuneate; petiole up to 3·5 cm. long, those of young leaves pink on upper surface: panicles up to 26 cm. long, lax, glabrous: pedicels 3·5–7 mm. long about three times as long as the flowers, slender, spreading: flowers hermaphrodite, greenish-yellow when fresh, glaucescent when dry: calyx 1–1·5 mm. diam., lobes broadly ovate or suborbicular, rounded to obtuse, glabrous: fruit an ovoid berry about 12 mm. long and 8 mm. diam., seated on the enlarged obconical pedicel, which is about 7 mm. diam. at the apex and crowned with the hardened remains of the perianth.

TRINIDAD: 9½ Mile Arima-Blanchisseuse Road, *Brooks*, 12477 *T.H.* !, 12573 *T.H.* !, and 12599 *T.H.* !.

Local name: *Laurier pulcherro.*

Also in British Guiana.

2. **Aniba** *Aubl.* Pl. Guian. i. 327 (1775).

Trees. Leaves sparse, coriaceous, penninerved. *Flowers* hermaphrodite or unisexual, sometimes bracteate. *Panicles* pedunculate, shorter than the leaves, axillary or sub-terminal, or aggregated on dwarf arrested axillary shoots. *Perianth-tube* more or less thick, sometimes at length narrowed at apex; segments 6, subequal. *Perfect stamens* 9 (see note *A. megacarpa*), the 1st and 2nd series eglandular with introrse 2-locular anthers, the 3rd series 2-glandular at the base with extrorse 2-locular anthers, staminodes of the 4th series small or wanting. *Ovary* included in the perianth tube, the style exserted. *Fruit* a berry, included at first in the subglobose perianth tube, later exserted, enclosed at the base by the enlarged, indurated, cupulate, truncate perianth-tube; perianth segments persistent or deciduous.

Key to Species.

a. Fully developed leaves glabrous on both surfaces, *b.*
  b. Veins on upper surface delicate, indistinct; leaves oblong, elliptic oblong or oblanceolate, thinly coriaceous, petioles usually reddish-brown..................................1. *trinitatis.*
  b. Veins on upper surface prominent, distinct, leaves usually obovate or oblanceolate, rigidly coriaceous......2. *megacarpa.*
a. Leaves minutely puberulous beneath at least on midrib and nerves, becoming furfuraceous-tomentellous when dried: leaves oblong, slightly obovate or oblanceolate, petioles usually light brown ....3. *panuriensis.*

1. **Aniba trinitatis** (*Meissn.*) *Mez* in Jahrb. Bot. Gart. Berl. v. 68 (1889).—*Aydendron trinitatis* Meissn. in DC. Prodr. xv. pt. 1, 91.

Aydendron citrifolium Griseb. Flora B.W.I. 284 (1864), not of Nees (1836).

Tree. Branchlets reddish brown, glabrescent: leaves mostly 9–18 cm. long, 2·5–6 cm. broad, oblong, elliptic oblong or oblanceolate, rather thinly coriaceous, glabrous on both surfaces, above primary nerves flat or slightly prominulous, veins inconspicuous, delicate, beneath nerves and veins prominulous; apex bluntly acuminate, base cuneate; petiole up to 1 cm. long, reddish brown, deeply channelled: panicles mostly 5–6 cm. long, shorter than the leaves, fascicled or aggregated on dwarf arrested axillary shoots, puberulous: pedicels usually longer than the flowers; flowers hermaphrodite: calyx 2 mm. diam., lobes concave-ovate, obtuse or sub-acute: ovary included in the perianth tube; style exserted: fruit a berry about 1·7 cm. long, ellipsoid; cupule cup shaped, up to 1 cm. long and 1 cm. diam.

TRINIDAD: St. Ann's, *Crueger* 59 (in Kew Herb., type number !); collector and locality not stated, 628 *T.H.* !; Aripo Savannah, *D.W.A.*, 5096 *T.H.* !; Maracas Bay, *Dannouse*, 6426 *T.H.* !; locality not stated, *Marshall*, 11622 *T.H.* !; 2¾ mile, Cumuto-Tumpuna Road, *Brooks*, 12465 *T.H.* !

Irois, *Crueger*, 121 *T.H.* !; 6 Mile, Mora Forest, *Marshall*, 11256 *T.H.* !; Arena Reserve, *Brooks*, 12149 *T.H.* !; locality not stated, *Brooks*, 12597 *T.H.* !, probably belong here, but material is insufficient for accurate determination. A specimen from Carenage, Beard's property, " tree, fruit white, succulent," Aug. 23, 1920 (not fruiting) *Broadway* 7187 ! in Kew Herb. must belong here, but the calyx tube appears longer than in typical specimens, the calyx segments have flattened, and the torus with androecium appears to have elongated (perhaps representing the development of the ovary ?); also the petiole is longer.

Local name: *Laurier canelle.*

2. **Aniba megacarpa** *Hemsl.* in Hook. Ic. Pl. xxviii. tt. 2751, 2752 (1905).

Tree. Branchlets glabrous: leaves 7–13 cm. long, 3·5–6·5 cm. broad, on young branchlets subopposite and clustered at apices, obovate or obovate-oblong, oblanceolate or sometimes almost elliptical, rigidly coriaceous, glabrous on both surfaces, glaucous and shining above, nerves and reticulation prominent above and beneath; apex rounded or abruptly and bluntly cuspidate, base cuneate; petiole up to 1·3 cm. long: panicles 2–4 cm. long, shorter than the leaves, axillary or sub-terminal, often fascicled, puberulous: flowers unisexual; bracts oblong or ovate, puberulous, caducous; perianth about 2 mm. diam., globose, tube very thick, lobes 6 inflexed, 2-seriate, rotund; fully developed stamens and staminodes not seen; ovary completely enclosed in perianth: fruit about 8 cm. long, oblong, glabrous, half-exserted: cupule about 5 cm. diam., thick, lobed, and prominently warted; pedicel enlarged.

TRINIDAD: *Dannouse*, 6786 *T.H.* (in Kew Herb., type !)

Top of Arima-Blanchisseuse Road, *Marshall*, 12131 *T.H.* !, and 9½ mile, Arima-Blanchisseuse Road, *Brooks*, 12487 *T.H.* ! almost certainly belong here, but further material is required. Fresh material, with mature flowers, is required, in order to determine the genus of this species with certainty. "I am not quite certain as to the composition and structure of the androecium" (*Hemsley*). "Tree 60 feet or more in height, yielding valuable yellow timber, called Laurier Matac" (*Hart*).

Local name: *Laurier pulcherro.*

3. **Aniba panurensis** *Mez* in Jahrb. Bot. Gart. Berlin, v. 58 (1889). —*Aydendron panurense* Meissn. in DC. Prodr. xv. pt. 1, 89 (1864).

Tree. Branchlets rusty tomentellous: leaves about 6·5–20 cm. long, 2·5–6·5 cm. broad, oblong- or elliptic- oblanceolate to obovate, coriaceous, above glabrous, with midrib, nerves and reticulation more or less flat; beneath minutely puberulous at least on midrib and nerves, becoming rusty furfuraceous when dry, with midrib, nerves and reticulation prominent; primary nerves 8–12 on each side of the midrib; apex acuminate, base cuneate; petiole up to 1 cm. long, channelled: panicles up to about 10 cm. long, rusty tomentellous: pedicels often longer than the flowers: flowers hermaphrodite; calyx about 2 mm. diam., lobes oblong-ovate, sub-acute, rusty; ovary included in perianth-tube; style exserted: fruit a berry, ellipsoid, about 18 mm. long; cupule about 1 cm. diam., cup shaped, warty, covering about ⅓ of the berry.

TRINIDAD: Maraval, *Baptiste*, 5876 *T.H.* !; locality and collector not stated, 6899 *T.H.* !; road to Maracas Bay, *Williams*, *Freeman*, *Cheeseman*, 11242 *T.H.* !; summit of Pigeon Hill, Tobago, *Freeman*, *Williams*, 11366 *T.H.* !; Arena Reserve, *Brooks*, 12458 *T.H.* !, 12584 *T.H.* !

Maraval, collector not stated, 5819 *T.H.* !, and Arima, *Dannouse*, 8901 *T.H.* ! probably belong here, but the material is insufficient for accurate determination.

The leaves when crushed and the fruit have a pleasant smell of spices.

Local name: *Laurier canelle.*

Widely distributed in tropical South America.

3. ***Cinnamomum** *Spreng.* Anleit. ed. 2, i. 340 (1817).

Trees. *Leaves* opposite or alternate, tripli- or sub-triplinerved. *Flowers* hermaphrodite or polygamous by abortion. *Panicles* axillary or sub-terminal. *Perianth-tube* short with 6 sub-equal segments. *Perfect stamens* 9; 1st and 2nd series eglandular, with introrse 4-locular anthers; the 3rd series 2-glandular at the base, glands subsessile, anthers 4-locular, extrorse; staminodes of the 4th series sagittate. *Ovary* sessile, narrowing into the style; stigma discoid. *Fruit* "a berry supported by a 6-fid or subtruncate hardened cupule."

Key to Species.

a. Leaves opposite, usually markedly triplinerved; nerve axils eglandular; petioles about 1 cm. long, stout.................. 1. *zeylanicum.*

a. Leaves alternate, tripli- or sub-triplinerved; nerve axils often glandular; petioles 2 or more cm. long, slender......2. *Camphora.*

1. ***C. zeylanicum*** *Nees* in Wall. Pl. As. Rar. ii. 74, iii. 32.

Tree. Branchlets glabrous: leaves 5–15 cm. long, 2·5–6 cm. broad, ovate or oblong, rigidly coriaceous, glabrous, glaucous and shining above, glabrous beneath; nerves on upper surface 3, impressed, beneath prominent and reticulation sub-prominent; apex obtuse or sub-acute, base cuneate or more or less rounded; petioles up to 1·5 cm. long: panicles up to about 21 cm. long, more or less shortly sericeous, often longer than the leaves: flowers whitish yellow; calyx 5 mm. diam., lobes oblong-obovate, bluntly acuminate: fruit " a berry, ovoid-oblong"; cupule 8–10 mm. diam.; perianth-segments persistent in fruit.

INDIA: Madras Herb. 9570 ! in Kew Herb.

TRINIDAD (cultivated): St. Ann's, *Broadway* 5272 in Kew Herb. !; Experiment Station St. Clair, *Hasnali*, 8190 *T.H.* !; " Hort. Trin," *Hart*, 4679 *T.H.* !, 5510 *T.H.* !, 5953 *T.H.* !.

GRENADA: 5637 *T.H.* !

2. ***C. Camphora*** *Nees et Eberm.* Handbk. Med. Pharm. Bot. ii. 430.—*Camphora Camphora* (L.) Karst.

Tall tree. Branchlets at first finely puberulous, early glabrescent; buds tomentellous, glutinous: laminae 5–11 cm. long, 3–5 cm. broad, broadly elliptic, tapering to both ends, coriaceous, glabrous or minutely puberulous above, glabrous or tomentellous beneath; nerves prominent and reticulation areolate on both surfaces; nerve axils often glandular; apex acuminate, base cuneate; petioles up to 3 or more cm. long: panicles up to 8 cm. long, pubescent, glabrescent: pedicels sub-equal to or longer than the flowers: calyx 5 mm. diam.: lobes oblong-obovate, acute or obtuse: fruit a drupe " the size of a large pea"; cupule about 5–6 mm. diam. (larger when mature?), saucer-shaped.

CHINA: Shanghai, *T. E. Bullock* 49 ! in Kew Herb.; Bing-jao, Che Kiang, *W. R. Carles* 174 ! in Kew Herb.

TRINIDAD (cultivated): Royal Botanic Gardens, *Freeman*, 8346 *T.H.* !, 8347 *T.H.* !, 8348 *T.H.* !; St. Augustine, *Freeman*, 8866 *T.H.* !, 8867 *T.H.* !; St. Augustine, *Brunton*, 9109 *T.H.* !; without locality, 625 *T.H.* !; " Hort. Trin.", *Hart* 4680 *T.H.* !

4. **Ocotea** *Aubl.* Pl. Guian. ii. 780 (1775).

Trees. Leaves alternate or scattered, coriaceous, penninerved. *Flowers* 1- or 2-sexual; sexes dioecious (polygamo-dioecious?). *Panicles* axillary or subterminal, pedunculate, lax or in small cymes, or with flowers contracted almost into heads, puberulous or tomentose. *Peranth-tube* usually short, with 6 subequal segments. *Perfect stamens* 9; 1st and 2nd series eglandular, with introrse 4-locular anthers, the anther-locules superimposed in pairs; 3rd series 2-glandular at the base, with extrorse 4-locular anthers; staminodes of 4th series 0 (? in all species). *Ovary* more or less sunk in the perianth-tube, narrowing into the style; in ♂ flowers narrow and functionless. *Fruit* a berry, globose, ovoid or oblong, when young sometimes included in the perianth-tube, but exserted when ripe, seated on, or enclosed at the base by, the perianth-tube which is enlarged, hardened, cup-shaped or expanded, truncate, with deciduous segments.

Key to Species.

a. Under surface of fully developed leaves glabrous or at least not hairy, *b.*
  b. Nervation of upper surface of leaves more or less impressed; venation not areolate................................1. *leucoxylon.*
  b. Nervation of upper surface of leaves slightly prominent, venation areolate......................................2. *arenaensis.*
a. Under surface of fully developed leaves hairy at least on midrib or in axils of primary nerves, *c.*
  c. Nerve axils (at least the lower) on under surface barbellate and foveolate, *d.*
    d. Primary nerves 4–6 on each side; panicles appressed puberulous .... 3. *Eggersiana.*
    d. Primary nerves more numerous; panicles pubescent...... 4. *fasciculata.*
  c. Nerve axils of leaves on under surface not barbellate or foveolate, *e.*
    e. Midrib markedly impressed above; primary nerves comparatively indistinct on upper surface...5. *canaliculata.*
    e. Midrib not markedly impressed above; primary nerves distinct on upper surface, *f.*
      f. Branchlets rusty pilose or tomentose, *g.*
        g. Under surface glaucous, the chief veins not more marked than the white finely areolated reticulation... 6. *glomerata.*
        g. Under surface not glaucous, the chief veins markedly parallel and reticulation lax.....................7. *oblonga.*
      f. Branchlets appressed puberulous............1. *Leucoxylon.*

1. **Ocotea leucoxylon** (*Sw.*) *Mez* in Jahrb. Bot. Gart. Berl. v. 329 (1889).—*Laurus leucoxylon* Sw. Prodr. 65. *Oreodaphne leucoxylon* (Sw.) Griseb. Fl. B.W.I. 283 (1864).

Tree. Branchlets appressed puberulous towards apex; leaves 7–24 cm. long, 3–9 cm. broad, oblong to ovate-oblong or elliptic, coriaceous, glabrous above; under surface minutely furfuraceous but not hairy, except when young; nerves more or less flat and veins flat or impressed on upper surface, prominulous beneath, apex acute or shortly and subacutely acuminate, base cuneate or rarely more or less rounded; petiole up to 1·5 cm. long: panicles up to about 17 cm. long, shorter than or subequal to the leaves, more or less rusty-puberulous: pedicels subequal to the flowers: sexes diœceous: calyx 2 mm. diam., lobes ovate-oblong, blunt; staminodes in ♀ flower minute, in ♂ flower wanting: fruit a globose, mucronate berry, nearly 1 cm. long; cupule 5–7 mm. diam., saucer-shaped; pedicel somewhat thickened; both cupule and pedicel dotted with warts.

TRINIDAD: Blanchisseuse, *Broadway* 5982 in Kew Herb.; Heights of Aripo, *Broadway*, 9872 *T.H.*!, and 10017 *T.H.*!; Morne Bleu, *Freeman, Williams*, 11966 *T.H.*!; Arena Reserve, *Brooks*, 12148 *T.H.*!; Northern Range Reserve, *Brooks*, 12489 *T.H.*!

Morne Bleu, *Freeman*, 9588 *T.H.*! and Guapo, *Dannouse*, 12212 *T.H.*! almost certainly belong here.

TOBAGO: Pigeon Hill, *Freeman, Williams*, 11364 *T.H.*!; Salem, Charleston Trace, *Williams*, 11789 *T.H.*!; Roxborough, *Franklyn*, 11905 *T.H.*!

JAMAICA: *W. Harris* 5229!, 5466!, 10963! in Kew Herb.

Local names: *Duckwood, Black Cedar.*

Also recorded by Mez from Cuba, St. Domingo, Porto Rico, St. Thomas and Martinique.

Tree yielding good timber much used in Tobago.

2. **Ocotea arenaensis** *R. L. Brooks*, sp. nov.; affinis *O. floribundae* Mez, sed floribus magis agglomeratis pedicellis brevioribus, floris ♂ ovario rudimentario dense pubescente, stigmate minore differt.

Tree. Branchlets puberulous, early glabrescent: leaves 6–17 cm. long, 2–7·5 cm. broad, elliptic or obovate, coriaceous, glabrous above, densely and minutely lepidote beneath, but not puberulous except when young; veinlets above areolate; nerves and veins beneath prominulous; apex very shortly and broadly acuminate; base cuneate; petiole up to 7 mm. long: panicles up to about 10 cm. long, puberulous: pedicels shorter than the flowers: sexes dioecious (or polygamo-dioecious?): calyx 3 mm. diam., lobes ovate, obtuse; staminodes in ♂ flower 0; rudimentary ovary densely pubescent; stigma comparatively insignificant; ♀ flower not seen: fruit a globose berry seated on a shallow saucer-shaped or flattened discoid cupule of about 6 mm. diam.; pedicel enlarged and hardened.

TRINIDAD: Arena Reserve, May 23, 1929, *Jeanpierre*, 12154 *T.H.*! (type in Kew Herb.), and May 15, 1929, *Brooks*, 12147 *T.H.*; Siparia Reserve, *Russell*, 12619 *T.H.*!

Differs from *O. floribunda* Mez, to which it is closely allied, in having the rudimentary ovary of the ♂ flower densely pubescent, with a comparatively small and insignificant stigma, and flowers more congested with shorter pedicels, but further material is required in order to ascertain the constancy of these characters, and any other points of difference. Yields good timber, much used in internal construction; the wood when freshly cut, and the leaves when crushed have a strong unpleasant scent.

Local names: *Laurier mattack, Laurier Siparia fine leaf.*

3. **Ocotea Eggersiana** *Mez* in Jahrb. Bot. Gart. Berlin v. 363 (1889).

Tree. Branchlets tomentellous, glabrescent: leaves 6–12 cm. long, 2–5 cm. broad, elliptic or obovate-elliptic, coriaceous; mature leaves glabrous or furfuraceous above, appressed puberulous (later furfuraceous) beneath, some nerve axils barbellate and foveolate on lower surface; midrib on both surfaces (especially at the base) usually warty; primary nerves 4–6 on each side of the midrib and more or less flat above, prominent beneath, reticulation subprominent beneath; apex bluntly caudate-acuminate, base cuneate; petiole up to 8 mm. long: panicles up to about 7 cm. long, appressed puberulous: pedicels subequal to or shorter than the flowers, slender: flowers dioecious; calyx about 4 mm. diam., lobes ovate-oblong, obtuse: berry ellipsoid 8 mm. long, 4 mm. diam. (mature fruit not seen?); cupule about 5 mm. diam. cup-shaped covering half the berry; pedicel enlarged and hardened in fruit.

Trinidad: Aripo, *D.W.A.*, 5106 *T.H.*!; top of Tucuche, *Williams*, 10119 *T.H.*!; Morne Bleu, *Freeman and Williams*, 11960 *T.H.*!; Arena Reserve, *Marshall*, 12133 *T.H.*!; Arena Reserve, *Brooks*, 12150 *T.H.*!; Toco Road, *Andrews*, 12317 *T.H.*! and 12324 *T.H.*!; Arena Reserve, *Brooks*, 12334 *T.H.*!, 12460 *T.H.*! and 12457 *T.H.*!.

In our Trinidad tree the slender, puberulous panicles, and the leaves which sometimes tend to be obovate, differ from the stouter tomentose panicles and ovate leaves in the description of *O. Eggersiana* Mez.

Local name: *Laurier mattack.*

Distribution: Guadeloupe to Trinidad.

4. **Ocotea fasciculata** (*Nees*) *Mez* in Jahrb. Bot. Gart. Berl. v. 248 (1889).

Tree. Branchlets appressed pubescent, becoming puberulous: leaves 6–12 cm. long, 2–3·5 cm. broad, elliptic- or oblong-lanceolate, coriaceous, upper surface glabrous, under surface furfuraceous, glabrous except in lower nerve axils which are usually barbellate and foveolate; primary nerves usually 7 or more on each side, like the midrib slender and prominent above; reticulation distinctly areolate; apex bluntly acuminate, base slightly cuneate; petiole up to 1 cm. long: panicles up to about 6 cm. long, apparently fasciculate on dwarf axillary shoots, shorter than the leaves, more or less silky puberulous: pedicels at length longer than the flowers: flowers hermaphrodite (or polygamo-dioecious?): calyx 3–4 mm. diam., lobes oblong-ovate, obtuse; staminodes 0: mature berry not seen by me; cupule warty cup shaped, 1 cm., covering half the berry in immature fruit; fruiting pedicel enlarged and hardened.

TRINIDAD: Maraval, *Dannouse*, 1299 *T.H.*!; locality not stated, 1457 *T.H.*!; Hort. Trin., *Broadway* 2192!; Hort. Trin., 4399 *T.H.*!; Mount St. Benedict, *Hunter*, 12123 *T.H.*!; Catshill Reserve, *Gooch and Swabey*, 12545 *T.H.*!.

Also in British Guiana (*Schomburgk* 928/1286! type coll.), Venezuela and Brazil.

5. **Ocotea canaliculata** (*Rich.*) *Mez* in Jahrb. Bot. Gart. Berl. v. 361 (1889).—*Laurus canaliculata* Rich. in Act. Soc. Hist. Nat. Paris, 1792, 108. *Oreodaphne cayennensis* Meissn. in DC. Prodr. xv. pt. 1, 133; and in Mart. Fl. Bras. v. pt. 2, 232, *fide* Mez.

Tree. Branchlets brown, appressed greyish or ferruginous tomentose, glabrescent: leaves 5–13 cm. long, 2–3·5 cm. broad, oblong- or elliptic-lanceolate, coriaceous, glabrous above, glaucous and puberulous beneath; primary nerves about 1 cm. apart in full-sized leaves, indistinct above and with midrib impressed, midrib and nerves prominent below; reticulation subprominent on both surfaces; apex gradually or obtusely acuminate, base cuneate; petiole 5–15 mm. long: panicles up to about 7 cm. long, rusty tomentose, spreading: pedicels equal to or shorter than the flowers: flowers hermaphrodite (polygamo-dioecious?); calyx 2–3 mm. diam., lobes ovate or oblong, obtuse or rounded, rusty tomentose without; staminodes 0: berry ellipsoid 1 cm. long, 8 mm. diam.; cupule about 1 cm. diam., cup-shaped, covering about half the berry; fruiting pedicel enlarged and hardened.

TRINIDAD: Maracas, *Crueger* 119! in Kew Herb.; Arima-Blanchisseuse Road, *Marshall*, 12130 *T.H.*!; Diego Martin, *Dannouse*!; 11 Mile, Arima-Blanchisseuse Road, *Brooks*, 12478 *T.H.*!

Mora forest, *Freeman*, 11257 *T.H.*! may belong here but material is insufficient. The type is from the River Para in French Guiana (in Herb. Vahl, in Herb. Haun.).

Local name: *Laurier petite-feuille.*

Occurs also in Brazil, according to Mez.

6. **Ocotea glomerata** (*Nees*) *Mez* in Jahrb. Bot. Gart. Berl. v. 294 (1889).—*Oreodaphne glomerata* Nees in Linnaea, xxi. 515. *Nectandra mollis* Griseb. Fl. B.W.I. 282, *fide* Mez.

Tree. Branchlets rusty-pilose: leaves usually 10–20 cm. long, 3–6 cm. broad, broadly oblong- or elliptic-lanceolate, coriaceous; upper surface glabrescent with nerves rusty-tomentose; under surface more or less rusty-pubescent, usually glaucous; primary nerves distinct; about 2 cm. apart on full-size leaves, strongly prominent beneath, reticulation areolate; apex acuminate or acute, very rarely obtuse and cuspidate; base cuneate; petiole up to 1·4 cm. long: panicles up to about 20 cm. long, usually longer than the subtending leaves, rusty tomentose, the cymes contracted almost into heads: flowers creamy yellow, hermaphrodite (or polygamo-dioecious?), subsessile; calyx about 3 mm. diam., lobes broadly ovate, obtuse, tomentose; staminodes 0: fruit a berry, oblong-ovoid, mucronate; cupule about 8 mm. diam., subsessile, shortly subturbinate, covering almost half the berry (mature fruit not seen?).

TRINIDAD: *Crueger* 123! in Kew Herb.; St. Anns, 626 *T.H.*!; Irois, *Crueger*, 1754 *T.H.*!; St. Joseph, 1756 *T.H.*!; Maracas, 1757 *T.H.*!; Moruga, 1758 *T.H.*!; woods on Cupar Grange, 2733 *T.H.*!; without locality, 6871 *T.H.*!; St. Patrick, *Cotton*, 11586 *T.H.*!; Southern Watershed Reserve, *Dardaine*, 11587 *T.H.*!; Morne L'Enfer Reserve, *Williams*, 12029 *T.H.*!; Siparia Reserve, *Williams*, 12199 *T.H.*!; without locality, *Rogers*, 12209 *T.H.*!; Siparia, *Broadway*, 12211 *T.H.*!; Southern Watershed Reserve, *Swabey*, 12231 *T.H.*!; Southern Watershed Reserve, *Russell*, 12412 *T.H.*!; Siparia, *Britton* 2823, in Herb. New York Botanical Garden.

Local names: *Laurier zaboca, Laurier cyp.*

7. **Ocotea oblonga** (*Meissn.*) *Mez* in Jahrb. Bot. Gart. Berl. v. 367 (1889).—*Mespilodaphne oblonga* Meissn., in DC. Prodr. xv. pt. 1, 107. *Ocotea Hartiana* Mez in Urban Symb. Antill. ii. 251.

Tree. Branchlets rusty tomentose: leaves 6–14 cm. long, 2·5–5 cm. broad, elliptic or broadly elliptic-oblanceolate; upper surface shining, the midrib tomentellous towards the base; lower surface rather rusty-pubescent with midrib tomentose towards the base; midrib and nerves prominulous above with chief veins markedly parallel and reticulation lax; midrib and nerves prominent beneath with reticulation more or less prominent; apex subacute or shortly and bluntly acuminate, base rather long cuneate; petiole up to about 1 cm. long: panicles up to about 11 cm. long, rusty-tomentellous: pedicels shorter than or subequal to the flowers: mature flowers not seen by me; calyx lobes ovate in bud: "berry ellipsoid 14 mm. long, 8 mm. diam.; cupule turbinate, rugose when dry, the pedicel much thickened and hardened."

TRINIDAD: *Crueger* 120, *fide* Mez.; Maraval, *Baptiste*, 5882 *T.H.*!; Santa Cruz, *Dannouse*, 6631 *T.H.*!; Arima, *Dannouse*!; Arena Reserve, *Brooks*, 12148 *T.H.*!; Southern Watershed Reserve, *Russell*, 12411 *T.H.*!; Tamana, *Marshall and Swabey*, 12400 *T.H.*!; Northern Range Reserve, *Brooks*, 12488 *T.H.*!, and 12600 *T.H.*!; Blanchisseuse Road, in forest near 10½ mile post, *Broadway*, 5528!

FRENCH GUIANA: *Sagot* 491! in Kew Herb.

BRITISH GUIANA: *Sandwith* 264, in Kew Herb.

Local name: *Fine-leaf laurier.*

Ocotea Hartiana, Mez is based on Trin. Herb. 5882 (in Herb. Krug and Urban) from "Trinidad ad Maraval." "Species pulcherrima, ex habitu praesertim *Ocoteae insulari* proxime accedens, characteribus floralibus tamen longius remota, fortasse si pluries colligetur ad Oreodaphnis subgenus removenda." There is a note by Mez dated 1904 on the type sheet that *Ocotea Hartiana* Mez "is without doubt the same as *O. oblonga* (Meissn.) Mez."

5. Nectandra *Roland* in Rottb. Act. Lit. Univ. Hafn. i. 279 (1778).

Trees. *Leaves* alternate, coriaceous, penninerved; primary nerves often decurrent along the midrib. *Panicles* axillary or terminal, the cymes usually lax; flowers 2-sexual, polygamous. *Perianth-tube* short; segments 6, sub-equal. *Perfect stamens* 9; 1st and 2nd series glandular, much shorter than the perianth, with wide subsessile extrorse 4-locular anthers, the locules arranged in a bow below the margin; 3rd series narrowed at the base, with 2 sub-sessile glands; anthers extrorse 4-locular; staminodes of 4th series small, club-shaped. *Ovary* small, in the perinath-tube or exserted; style short. *Fruit* a berry, globose, ovoid or oblong, seated on, or enclosed at the base by, the enlarged, indurated, truncate, cupulate or expanded perianth-tube (when young sometimes included in the sub-globose tube?); perianth-segments deciduous in fruit.

Key to Species.

a. Branchlets (at least when young) densely and conspicuously short rusty-tomentose; inflorescence very lax, longer than the subtending leaves; primary nerves conspicuously impressed above..1. *surinamensis*.

a. Not as above, *b*.

 b. Primary nerves markedly decurrent along the midrib above, so that the latter is unusually (up to 2 mm.) broad: fls. large (up to 6 mm. diam.); the calyx with scattered short hairs or subglabrous ....2. *rectinervia*.

 b. Primary nerves not markedly decurrent; fls. small; calyx grey tomentellous, *c*.

  c. Secondary nerves not markedly transverse or parallel; reticulation prominent beneath; nerve axils beneath barbellate or not................................3. *martinicensis*.

  c. Secondary nerves at right angles to midrib and parallel; reticulation not distinct beneath; nerve axils beneath not barbellate ....4. *membranacea*.

1. **Nectandra surinamensis** *Mez* in Jahrb. Bot. Gart. Berl. v. 454 (1889).

Tree. Branchlets rusty-tomentose: leaves up to 29 cm. long, 4–11 cm. broad, obovate to oblanceolate, coriaceous; upper surface with midrib and nerves tomentellous at the base; lower surface sometimes glaucous, with nerves and veins rusty-tomentose; nerves and veins deeply impressed above, prominent beneath with strong reticulation, the primary nerves scarcely decurrent along the midrib; apex bluntly acuminate; base rather long cuneate; petiole up to 1·75 cm. long: panicles up to 20 cm. long, more or less rusty tomentellous: pedicels longer than the flowers, slender spreading: flowers hermaphrodite; calyx 3 mm. diam., lobes ovate, obtuse, pubescent; staminodes club shaped: fruit a globose berry about 1 cm. diam. seated on a cupule which is about 7 mm. diam., saucer-shaped and very shallow, the pedicel enlarged and hardened.

TRINIDAD: without locality, 630 *T.H.* ! ; Maracas, 1755 *T.H.* ! and 1763 *T.H.* ! ; " Hort. Trin.", *Broadway*, 3740 !, 5504 !, 5510 !, and 10078 *T.H.* ! ; without locality, *C. S. Rogers*, *T.H.* ! ; Southern Watershed Reserve, *Russell*, 12119 *T.H.* ! ; Tamana, *Swabey and Marshall*, 12400 *T.H.* ! ; Arena, *Brooks*, 12549 *T.H.* !.

BRITISH GUIANA: Cabalebo River, *im Thurn* s.n. ! (type in Kew Herb.).

Local names: *Laurier mattack, Laurier zaboca.*

Also in French and Dutch Guiana.

2. **Nectandra rectinervia** *Meissn.* in DC. Prod. xv. pt 1, 158 (1864).—*Nectandra turbacensis* var. γ. *mexicana* Meissn. l.c. 152, and in Mart. Fl. Bras. v. pt. 2, 259.

Tree. Branchlets at apices appressed pubescent (early glabrescent): leaves 5–15 cm. long, 2–5 cm. broad, elliptic or oblong-lanceolate or oblanceolate, rigidly coriaceous, appressed pubescent, glabrescent on both surfaces; nerves prominulous above, lower surface with nerves and reticulation prominent; primary nerves markedly decurrent along the midrib, often to the nerve below; apex more or less bluntly acuminate, base cuneate; petiole up to 1·25 cm. long: panicles up to about 10 cm. long, shorter than or subequal to the leaves, puberulous: pedicels rather longer than the flowers: flowers hermaphrodite; calyx 6 mm. diam., lobes ovate-oblong obtuse; staminodes triangular: fruit a berry " ellipsoid, 12 mm. long, 6 mm. diam. " ; cupule about 1 cm. diam., cup-shaped, warty, " covering up to ⅓ of the berry " ; pedicel enlarged and hardened in fruit.

TRINIDAD: Arouca, *Crueger* 281 ! in Kew Herb.; without locality, 627 *T.H.* ! ; Laventille, 1768 *T.H.* ! ; Arouca, 1753 *T.H.* ! ; Bridge of Cipero, 2734 *T.H.* ! and 3039 *T.H.* ! ; Arima, *Dannouse*, *T.H.* ! ; St. Ann's, *Broadway*, 12210 *T.H.* ! ; St. Ann's, *Marshall*, 12259 *T.H.* !.

VENEZUELA, *Funck* 151 (co-type ! in Kew Herb.).

Also recorded by Mez from Mexico, Nicaragua and Venezuela.

3. **Nectandra martinicensis** (*Jacq.*) *Mez* in Jahrb. Bot. Gart. Berl. v. 439 (1889).—*Laurus martinicensis* Jacq. Coll. ii. 109, t. 5, fig. 2.

Small tree. Youngest branchlets sericeous, older appressed pubescent: terminal buds silky white tomentose: leaves 10–20 cm. long, 4–6·5 cm. broad, elliptic or oblong-elliptic, thinly coriaceous, both surfaces with more or less sparse appressed hairs; on upper surface midrib often prominent towards apex and deeply impressed towards base with nerves and reticulation prominent; on under surface nerves and reticulation prominent; primary nerves often decurrent along the midrib; apex gradually and broadly acuminate, base cuneate; petiole up to 1 cm. long, channelled: panicles up to about 10 cm. long, rather long pedunculate, grey tomentose to glabrescent, with cymes rather aggregated on lateral branchlets: pedicels longer than the flowers, like the buds densely tomentellous:

flowers hermaphrodite; calyx 5–6 mm. diam. when open, lobes ovate or oblong, obovate, obtuse; filaments hairy; staminodes club shaped: fruit a berry, ellipsoid about 11 mm. long, 8 mm. diam. seated on a cupule about 5 mm. diam., turbinate, mouth saucer-shaped, the pedicel enlarged and hardened.

TRINIDAD: *Sieber*, "Fl. Trinitatis," 99! in Kew Herb.; without locality, 6886 *T.H.*!; Southern Watershed Reserve, *Marshall*, 11642 *T.H.*!; Quinam Road, *Cotton*, 11643 *T.H.*!; Tabaquite, *Dannouse*, 12213 *T.H.*!; Southern Watershed Reserve, *Swabey*, 12391 *T.H.*!; 10½ mile Penal Rock Road, *Williams*, 12173 *T.H.*!; North Road, *Marshall*, 12392 *T.H.*!; Southern Watershed Reserve, *Marshall*, 12406 *T.H.*!; Plum Road, *Marshall*, 12428 *T.H.*!.

Also recorded by Mez from Panama.

TOBAGO, *fide* Britton under *N. antillana* Meissn., specimens not quoted, possibly belong here, but specimens not seen by us.

Local name: *Laurier cypre.*

4. **Nectandra membranacea** (*Sw.*) *Griseb.* Fl. B.W.I. 282 (1864); Meissn. in DC. Prod xv. pt. 1, 161 (1864).—*Laurus membranacea* Swartz. Prod. 65, and Fl. Ind. Occ. ii. 713. Mez cites the following, among others, as synonyms of this species: *Oreodaphne strumosa* Gris. l.c. 284 (in adnot. ad *O. parvifloram*). *Nectandra cuspidata* var. δ. *strumosa* Meissn. in DC. Prod. l.c. 159. *Nectandra leucantha* β. *Rodiaei* Griseb. l.c. 282.

Tree. Branchlets puberulous: leaves mostly 10–20 cm. long, 3–6·5 cm. broad, narrowly elliptic or oblong-ovate, thinly coriaceous; upper surface glabrous except on the puberulous to glabrescent nerves; under surface puberulous, the nerves tomentellous; primary nerves on upper surface more or less flat, prominent beneath, usually decurrent down the midrib, principal veins parallel, delicate, indistinct; apex rather acutely subcaudate-acuminate; base cuneate; petiole up to 1·5 cm. long: panicles up to about 13 cm. long, usually shorter than the subtending leaves, puberulous: pedicels longer than the flowers: flowers hermaphrodite?; calyx 4 mm. diam., lobes oblong-ovate, rounded, the edges reflexed when open; staminodes club-shaped: mature berry not seen; cupule 6–7 mm. diam., turbinate, mouth saucer-shaped; pedicel enlarged; fruiting cupule and pedicel warty.

TRINIDAD: without locality, *Crueger* 91 (*fide* Mez); Hts. of Aripo, *Broadway*, 9873 *T.H.*!.

Maraval, *Baptiste*, 5849 *T.H.*! almost certainly belongs here, but the material is insufficient.

TOBAGO: *Williams*, 11805 *T.H.*!.

MARTINIQUE: *Hahn* 975! in Kew Herb.

Also recorded by Mez from Jamaica, Porto Rico, St. Thomas and Dominica.

6. Persea *Mill.* Gard. Dict. Abr. ed. 4 (1764).

Trees. *Leaves* alternate or sub-opposite, persistent, coriaceous, penninerved. *Panicles* axillary or subterminal. *Flowers* small, hermaphrodite, or by abortion polygamous, bracteate. *Perianth-tube* short; segments 6, subequal (or the 3 outer smaller). *Perfect stamens* 9, the filaments of 1st and 2nd series eglandular, with introrse 4-locular anthers; of the 3rd series 2-glandular at the base, the glands subsessile, anthers extrorsely 4-locular; staminodes of 4th series cordate or sagittate, stipitate. *Ovary* sessile; stigma discoid. *Fruit* a berry; fruiting perianth deciduous (or persistent); pedicel thin or more or less thickened.

***Persea americana** *Mill.* Gard. Dict. ed. 8 (1768).—*Persea gratissima* Gaertn. f. Fruct. & Sem. iii. 332 (1807). *Persea Persea* (L.) Cockerell in Bull. Torr. Club xix. 95 (1892). *Laurus Persea* L. Sp. Pl. ed. 1, 370.

Tree. Branchlets tomentellous: leaf-blades " 7–25 cm. long, 3–16 cm. broad " varying from oblong to elliptic or oval, broadly ovate or even suborbicular; puberulous, at least on the midrib above, glabrescent? on the midrib and nerves below; primary nerves more or less flat on the upper surface, prominent beneath, both surfaces of fully developed leaves finely reticulate; apex obtuse or broadly cuspidate; base rounded or cuneate: flowers in broad compact panicles at the ends of the young branchlets, shortly pedicellate, bracteate: calyx about 5 mm. diam., lobes oblong-oblanceolate; stamens with the lower locules of the anthers touching the upper at the side: berry " in cultivated species from 10 even to 20 cm. long," pear shaped; pericarp thick, edible: fruiting perianth segments deciduous.

TRINIDAD: *Sieber*, " Fl. Trinitatis," 69! in Kew Herb.; *Broadway* 5201!; Hort. Trin. *Broadway* 5491!; without locality, 2652 *T.H.*!

Local names: *Avocado Pear, Alligator Pear, Zaboca.*

Also recorded by Mez from Mexico, Central America, Guatemala, Nicaragua, Bahamas, Cuba, Jamaica, St. Domingo, Porto Rico, St. Thomas, St. Croix, Antigua, Montserrat, Guadeloupe, Dominica, Martinique, St. Vincent, Guiana, Venezuela, Colombia, Peru, Bolivia, Brazil, Madeira, Madagascar, Mauritius, Rodriguez, Seychelles and Java.

7. Phoebe *Nees*, Syst. Laur. 98 (1836).

Trees or *shrubs*. *Leaves* alternate, coriaceous or chartaceous, penni- or subtriplinerved. *Panicles* axillary or subterminal. *Flowers* hermaphrodite. *Perianth-tube* short; segments 6, subequal, or the outer more rarely a little smaller than the inner. *Perfect stamens* 9, the filaments of the 1st and 2nd series eglandular with introrse 4-locular anthers, those of the 3rd series 2-glandular at the base, anthers extrorsely 4-locular; staminodes of the 4th series cordate-sagittate. *Ovary* sessile; stigma discoid. *Fruit* a berry, fruiting perianth scarcely enlarged, persistent below the fruit.

Phoebe elongata (*Vahl*) *Nees*, Syst. Laur. 116 (1836).—*Laurus elongata* Vahl ex Nees, l.c. *Phoebe cubensis* Nees, l.c. 120, *fide* Britton in Scientific Survey Porto Rico and the Virgin Islands, v. pt. 3, 319.

Tree, "6–12 m. tall, occasionally up to 20 m." (Britton): branchlets pubescent or glabrous, buds more or less tomentose; leaves about 5–17 cm. long, 2–7 cm. broad, lanceolate or elliptic lanceolate to broadly ovate elliptic, penni- or generally subtriplinerved, glabrescent above, generally pubescent or very sparingly pilose on midrib beneath with lower nerve axils barbellate, lamina beneath furfuraceous or glabrous; midrib and nerves on upper surface flat and reticulation indistinct; midrib and nerves prominent beneath, reticulation usually distinct and subprominent beneath; apex acuminate, base gradually or abruptly cuneate to almost rounded; petiole up to 12 mm. long: inflorescence up to about 30 cm. long, peduncles tomentose to glabrous: calyx up to about 6 mm. diam., puberulous, lobes ovate; stamens with the lower locules of the anthers touching the upper at the base; staminodes sagittate; ovary glabrous: berry ellipsoid, about 13 mm. long and 7 mm. diam.

Var. **elliptica** *R. L. Brooks*, var. nov.; a typo foliis elliptico-lanceolatis vel ellipticis usque ovatis differt.

TRINIDAD: *Crueger* 282!; Woods at Valencia, *Eggers* 1414 in Kew Herb.!; Woods at Arima, *Eggers* 1471 in Kew Herb.!; St. Anns Reservoir, *Hart*, 5117 *T.H.*!; Diego Martin, *Broadway* 5375!; Arima, *Dannouse*!; Road to Maracas Waterfall, 2731 *T.H.*!; Siparia, *McLean*! s.n.; without locality, 1451 *T.H.*!, 1769 *T.H.*!, 6617 *T.H.*! and 12214 *T.H.*!

CUBA: *Wright* 2583, 2591! in Kew Herb.

Var. **lanceolata** *R. L. Brooks*, var. nov.; a typo foliis lanceolatis differt.

TRINIDAD: Valencia, *Rosales*, 12153 *T.H.*!; Tacarigua, 12155 *T.H.*!; Paria-Morne Bleu Road, *Brooks*, 12480 *T.H.*!.

Also recorded by Mez from Porto Rico, Montserrat, St. Croix, Martinique, Guadeloupe, St. Domingo and St. Vincent.

The two types described here appear at first sight to represent two totally distinct species, but from the material available I am unable to find any characters which do not intergrade. In several specimens the flowers are badly galled; in others the apparent difference in size may be due to difference in age.

Local names: *Laurier Cypre, Laurier mama z'enfant.*

8. Cassytha *L.* Sp. Pl. 35 (1753).

Climbing perennial *herb*. *Stems* twining, filiform, adhering by means of suckers. *Leaves* represented by minute scales. *Flowers* spicate, subsessile in axil of a scale-like bract with 2 minute bracteoles. *Perianth-tube* at length baccate; segments 6, the 3 outer much smaller than the inner. *Perfect stamens* 9, those of the 1st and 2nd series eglandular with introrse 2-celled anthers, those of 3rd series with 2 subsessile glands, anthers extrorsely 2-celled, staminodes of 4th series conspicuous. *Ovary* scarcely immersed in perianth tube during flowering, later altogether enclosed by the enlarged perianth-tube which becomes constricted at the apex. *Fruit* enclosed by the succulent perianth-tube, perianth segments persistent.

Cassytha filiformis *L.* Sp. Pl. 35 (1753).—*Cassytha americana* Nees. Syst. 664 (1836).

Stem up to 2 mm. thick, glabrous, yellowish: flowers about 2 mm. long, " white ": fruit 5–6 mm. diam., berry globose, enclosed by the succulent perianth-tube, which is crowned by the persistent segments.

TRINIDAD: Aripo Savannah, *Crueger*!; without locality, *Crueger* or *Finlay*, 2735 *T.H.*!; *Freeman* 7938 *T.H.*! and 9080 *T.H.*!; *Broadway* 5322!; *Freeman* and *Farmer*!; Tabaquite, *Dannouse*!; Erin, *Broadway* 7338!; Guayaguayare, *Mota*, 11974 *T.H.*!.

UNDETERMINED TRINIDAD SPECIMENS.

1. **Ocotea sp. ?** Small tree: branchlets appressed, more or less rusty tomentellous, glabrescent: leaves 6·9 cm. long, 2–4·5 cm. broad, elliptical, upper surface glabrous and glaucous, beneath finely puberulous especially on nerves and veins, glabrescent, the lower nerve axils often barbellate and foveolate; midrib, nerves and reticulation sub-prominent above, prominent beneath; midrib often warty at the base above; apex shortly acuminate, base cuneate and decurrent on the warty petiole: panicles up to about 9 cm. long, axillary or sub-terminal, appressed puberulous: flowers dioecious? white, fragrant; calyx about 3 mm. diam., sparsely puberulous or glabrous; anthers with locules superimposed in pairs: fruit not seen.

TRINIDAD: Eastern Main Road, east of Valencia, March 13th. 1925, *Broadway* 5573! in Kew Herb.. Cf. *O. Eggersiana* Mez.

2. **Phoebe sp. ?** Small tree: branchlets glabrescent, with hollow pith: leaves up to about 25 cm. long, up to 12 cm. broad, elliptical to ovate elliptical; upper surface glabrous, at least when mature, lower surface appressed pubescent; midrib impressed and nerves more or less flat above with reticulation finely areolate, midrib and the decurrent nerves strongly prominent beneath, reticulation obscured by the indumentum; apex acuminate or caudate-acuminate, base cuneate; petiole up to 5 cm. long, channelled: flowers not seen: fruit a berry about 2 cm. long, 2 cm. wide, seated on the persistent ? unequal perianth segments; pedicel enlarged and hardened; seed with two large fleshy cotyledons.

TRINIDAD: Junction of Blanchisseuse and Las Lopas Roads, February 26th, 1926, *Broadway* 5981 in Kew Herb. !. This may, possibly, belong to another family.

SPECIES EXCLUDED AND SYNONYMS.

1. *Aydendron citrifolium* Griseb. l.c. 284, not of Nees. Recorded from "St. Ann's" (*Crueger* 59 !) by Grisebach = *Aniba trinitatis* (Meissn.) Mez.

2. *Nectandra antillana* Meissn. Meissner recognised that Grisebach's *N. leucantha* was not the species so named by Nees, and described it as *N. antillana*. In this he has been followed by Fawcett and Rendle, and by Britton. Britton records *N. antillana* from Tobago, but does not cite a specimen, and we have seen no material.

3. *Nectandra dominicana* (Meissn.) Mez.—*Oreodaphne dominicana* Meissn. in DC. Prodr. xv. pt. 1, 139. Recorded from Trinidad by Mez on the strength of *Sieber* 229, but, as pointed out by Sandwith, "many of Sieber's specimens, labelled Trinidad, are almost certainly from Guadeloupe, and this is probably one of them."

4. *Nectandra leucantha* Griseb. l.c. 282, not of Nees=*N. antillana* Meissn.

Nectandra leucantha b. *Rodiaei* Griseb. l.c. 282, not of Schomb.= *N. membranacea* Griseb. *fide* Mez. *N. leucantha* Nees occurs in British Guiana ! and Brazil !, but does not appear to extend to Trinidad.

5. *Nectandra mollis* Griseb. l.c. 282, not of Nees, as regards the Trinidad record=*Ocotea glomerata* (Sw.) Mez.

6. *Nectandra sanguinea* Griseb. l.c. 281, not of Rottb., as regards the Trinidad record *Sieber* 99=*N. martinicensis* Mez.

7. "*Nectandra strumosa* Mez" appears to be a nomen nudum; *Oreodaphne strumosa* Griseb. l.c. 284 (in adnot. ad *O. parvifloram*), is referred by Mez to *Nectandra membranacea* (Sw.) Griseb.

8. *Ocotea floribunda* (Sw.) Mez, is recorded by Britton (Scientific Survey of Porto Rico and the Virgin Isls. v. pt. 3, 321) from "Trinidad"; no specimen is cited, and the New York Botanical Garden specimens have not been seen. Dr. Britton has collected in Trinidad and it is possible that he refers to the tree here called *O. arenaensis* R. L. Brooks, sp. nov.

9. *Endlicheria sericea* Nees.—*Aydendron sericeum* (Nees) Griseb. l.c. 284. Recorded from Trinidad on the strength of *Sieber* 175. This again is probably from Guadeloupe.

BIBLIOGRAPHY.

1. Bentham and Hooker, Genera plantarum, iii. (1883).

2. Britton and Wilson, Scientific Survey of Porto Rico and the Virgin Islands, v. pts. 2 and 3 (1924).

3. De Candolle, Prodromus Systematis Naturalis Regni Vegetablis, xv. (1864).

4. Engler and Prantl, Die Natürlichen Pflanzenfamilien, iii. Abt. 2, 2a (1891).

5. Fawcett and Rendle, Flora of Jamaica, iii. pt. 1 (1914).

6. Grisebach, Flora of the British West Indian Islands (1864).

7. Thiselton-Dyer, Hooker's Icones Plantarum, xxviii. tt. 2751, 2752 and 1905.

8. Mez, Lauraceae Americanae Monographicae Descriptae, in Jahrbuch des königlichen botanischen Gartens und des botanischen Museums zu Berlin, v. 1–556, t i-iii (1889).

9. Nees, Systema Laurinarum (1836).

10. Urban, Symbolae Antillanae, iv. 243–250 (1905); viii. 230–235 (1920).

11. Mez, Lauraceae novae in Urban, Symbolae Antillanae, ii. 251–251 (1900).

XXIX—SOME NOTES ON THE TROODOS PINE OF CYPRUS.*

A. Foggie (Forest Department, Cyprus).

The Troodos pine has been known generally by the name of *Pinus laricio* Poir., var. *Pallasiana* Endl. Comparison of specimens from Cyprus with the description of this variety in Dallimore and Jackson's "Coniferae" shows discrepancies in various points as indicated below. This caused the present writer to doubt whether the Troodos pine did belong to this variety, and, on making a short investigation, it was found that the identification was correct but that the nomenclature was exceptionally confused. The correct name of this pine, under the International Rules of botanical nomenclature, as found by Drs. Sprague and Turrill of Kew, is *Pinus nigra* Arnold var. *caramanica* (Loud.) Rehd.

The Troodos pine occupies a well defined locality in Cyprus, being confined to the slopes of Mt. Troodos or "Chionistra." Isolated specimens are found between 3000 and 3500 ft. altitude. Above this it occurs in a mixed stand with *Pinus halepensis* Mill. and *Quercus alnifolia* Poech between 3500 and 4000 ft., becoming dominant above this altitude and extending up to the tree limit, 5700 to 5850 ft. In the upper half of its area *Juniperus foetidissima* Willd. is commonly associated with it as a secondary species. The soil on which it grows is generally shallow and is a residual skeletal soil derived from the underlying intrusive igneous rocks, mainly diabase and gabbros, the latter giving a deeper, stiffer soil on the gentler slopes.

The Troodos pines when young have straight stems with thin, narrow-conical to elliptic crowns formed by numerous whorls of short, horizontal branches of medium thickness. The mature needles are dark green. When old the tree generally has a flat-topped crown with heavy upper branches which may be thicker and larger than the lower ones. It is interesting to note that in these details of habit, both in youth and age, the Troodos pine seems to agree with the Corsican pine, *Pinus nigra* Arnold (syn. *P. laricio* Poir.), in its native habitat as described by Elwes and Henry (12). Referring to the Forest of Valdoniello in Corsica, of which they show two photographs on Plate 114, they state :—

---

*This paper is the result of studies carried out during a Refresher Course at the Imperial Forestry Institute, Oxford, under the direction of Dr. J. Burtt Davy. The writer's thanks are due to the Director of the Royal Botanic Gardens, Kew, and to the Keeper of Botany, British Museum, S. Kensington, for permission to study the material there, and to Drs. Sprague and Turrill of Kew for help on several points.

> " Plate 114, from a negative kindly lent us by M. A. André, Inspector of the French Forest Service, shows very well the peculiar habit assumed by the Laricio in old age, the crown becoming remarkably flattened, owing to the bending over of the leading shoot and the increase in size in the upper branches, which become very stout and horizontal or even curve slightly downwards."

To deal briefly with the synonymy, the species was first named and described by Arnold in 1785 (1) as *Pinus nigra.* It was, later, (1804), renamed *Pinus laricio* by Poiret, by which name it has been commonly known.

This species includes the Corsican, Austrian, and Caramanian pines, the Troodos pine belonging to the last mentioned.

The Caramanian pine was first collected by Professor Pallas in the Crimea, and was named and figured by Lambert as *Pinus Pallasiana* (2). Later, in 1838, Loudon reduced it to the rank of a variety of *Pinus laricio* as *P. laricio* 3 *caramanica* (5). Antoine in 1840 (6) restored the old specific epithet for the variety as *P. laricio* var. *Pallasiana* ; this course was also followed by Endlicher in 1847 (7). Dallimore and Jackson (15) quote Endlicher as author of this combination. Ascherson and Graebner, though returning to the specific name *Pinus nigra* Arnold, still use the epithet *Pallasiana* for the variety (10). Rehder in 1927 (14) published the correct name under the International Rules of botanical nomenclature namely, *Pinus nigra* Arnold var. *caramanica* (Loud.) Rehd.

It was necessary to determine whether the Troodos pine could properly be included in Loudon's variety. In this question the extant literature does not give much assistance. The Troodos pine is assigned in the latest, and still most accurate, work on Cyprus, Holmboe's Studies on the vegetation of Cyprus (13), to *Pinus nigra* Arnold sub-species *Pallasiana* (Lamb.). Elwes and Henry (12) dismissed Lambert's *Pinus Pallasiana* as indeterminate, while in Dallimore and Jackson (15) the description, which is very brief, did not tally with the available material. Other works on the Cyprus flora did not help. Kotschy, for example (8), quoted three different varietal names indiscriminately throughout, and Post (11) did not distinguish it as a variety. The question, therefore, had to stand over until an opportunity was found to visit Kew. The material from the Imperial Forestry Institute, and other good material of the

Troodos pine from the collections of Sintenis and Rigo and of Post which was found there, was compared with Lambert's original description and plate. This material was also checked against other specimens of the same variety coming from Asia Minor. The type specimen collected by Pallas and kept in Lambert's Herbarium is now in the European Collection in the British Museum, South Kensington, under the original name of *Pinus Pallasiana* Lamb. The specimens from the Imperial Forestry Institute of the Troodos Pine (Nos. 20,500, 27,345, and 27,346) were compared with the type specimen and were found to be a good match.

Ascherson and Graebner (10) followed Elwes and Henry in dismissing Lambert's description of *P. Pallasiana* as indeterminate. They quoted Link and Koch as the authorities for the view that Lambert's *P. Pallasiana* might belong to *P. Pinaster*. Koch (9), however, quotes it under *P. maritima* Mill., and merely mentions that it might perhaps be better placed under *P. Pinaster* Sol. ex Ait. But Lambert (32) also gives a good description with two plates of *P. Pinaster* Sol. ex Ait.; he also describes a *P. maritima* Michel et Phytopin (4).* The indeterminate description is not that of *P. Pallasiana* and is more likely to be that of *P. maritima* Michel et Phytopin.

Though the type specimen is filed in South Kensington with *P. nigra* Arnold (syn. *P. laricio* Poir.), the specific name *P. Pallasiana* Lamb. is still retained there. This course is also followed by A. de Degen and G. Bujorean, who collected in Caras-Severin (Roumania) and whose material is also at South Kensington. The differences between the Caramanian pine and typical *P. nigra* Arnold do not appear to be sufficient to warrant restoration to the rank of species. In general appearance, in bud characters, and in general cone characters, var. *caramanica* definitely belongs to the species *P. nigra* Arnold.

Var. *caramanica* is separated from the species largely on leaf characters and some details of the cone. The leaf characters are as follows: Leaves straight or only occasionally or slightly twisted at the base, broad, but not rigid, in the sense that they bend slightly when lightly tapped on the apex; hypoderm thickened at the angles and locally thickened to 2–4 cells thick. The variety therefore lies between the type and var. *austriaca* (*P. laricio* var. *nigricans*) in this character. Resin canals few (8 or 9), distinct, with firm surrounding cells; stomatic lines 9–12 on each surface. This description differs considerably from that given by Dallimore and Jackson (15) for var. *Pallasiana* Endl.

It is generally stated that the principal differences in the cone are that the ridge or keel of the apophysis of the cone scale is blunt, that the tubercle is furnished with a spine, and that the cone is often twice the size of that in the typical form. Both Antoine and Endlicher state also that the upper surface of the cone scale bearing the seed is not sphacelate.

---

*Koch (12) treats *P. Pinaster* Sol. ex Ait (1789) as distinct from *P. Pinaster* Mor. (1827), which he places under *P. maritima* Mill. (1795).

Dallimore and Jackson state that the variety grown in Britain and known as *Pallasiana* is a stout, branched, fastigiate tree. Rehder makes the same observation with regard to var. *caramanica* which he unites with var. *Pallasiana.* This, however, is not the common form in Cyprus, but the writer has been informed by Mr. R. R. Waterer, Assistant Conservator of Forests, Cyprus, that he has occasionally come across fastigiate trees in the Troodos Forest.

Dallimore and Jackson class this variety with *P. nigra* var. *austriaca* (*P. laricio* var. *nigricans* Parl.), the Austrian Pine, as occurring naturally on limy soils, and material from G. Bujorean from Roumania is noted to have come from a calcareous soil. I believe that it grows on limestone also in the Crimea and Anatolia. At the altitude at which it occurs in Cyprus, however, there are only igneous rocks.

The distribution of var. *caramanica* appears to be as follows : the Crimea, the western end of the Transylvanian Alps, Asia Minor, and Cyprus. Post's Flora does not record it for Palestine. The record made by Degen and G. Bujorean of this variety from Mt. Domugled near Herkules in the district of Caras-Severin (Krassó-Szüršny) in Roumania is interesting. It may be an outlying colony which has established itself after migration up the Danube or it may be that this variety exists more widely in the Balkan Peninsula than is at present known. *Pinus nigra* var. *caramanica* may be taken to be the most easterly geographical variety of the species, and in character to stand between the type and var. *austriaca.*

BIBLIOGRAPHY.

1. ARNOLD, *Reise nach Mariazell*, 8 (1785).
*2. LAMBERT, *Genus Pinus*, ed. 1803–24, ii. t. i (1824).
3. LAMBERT, *Genus Pinus*, ed. 1803–24, i. tt. iv. v. (1803).
4. LAMBERT, *Genus Pinus*, ed. 1803–24, i. t. vi. (1803).
5. LOUDON, *Arb. et Fr. Brit*, iv. 2201 (1838).
6. ANTOINE, *Coniferen*, 4 (1840).
7. ENDLICHER, *Synopsis Coniferarum*, 179 (1847).
8. UNGER U. KOTSCHY, *Die Insel Cypern*, 111, 120, 214 (1865).
9. KOCH, *Dendrologie*, ii. Abt. 2, 269–325 (1873).
10. ASCHERSON U. GRAEBNER, *Handb. der Mittel-Eur. Flor.* i (1896).
11. POST, *Mem. Herb. Boiss*, no. 18, 100 (1900).
12. ELWES AND HENRY, *Trees of Gt. Britain and Ireland*, ii. 407 (1909).
13. HOLMBOE, *Studies on the Vegetation of Cyprus*, 29 (1914).
14. REHDER, *Manual of Cultivated Trees and Shrubs*, 61 (1927).
15. DALLIMORE AND JACKSON, *Handbook of the Coniferae*, ed. 2, 407 (1930).
16. BERNHARD, *Waldverhaltnisse der Turkei*, Sonderabdr. aus den Tharandt. Forst. Jahrb. (Published separately). (1931).

---

*A full account of the various editions of this work is given in "Aylmer Bourke Lambert and the genus Pinus," by H. W. Renkema and John Ardagh in Journ. Linn. Soc. Bot. xlviii. 439 (1930).

XXX—ON THE FLORA OF THE NEARER EAST: XIV.*

THE ELMS OF WESTERN THRACE. H. GRIFFITH TEDD AND W. B. TURRILL.

The taxonomy of the genus *Ulmus* is in a very confused condition. Even for British and Central European elms, presumably growing in areas from which abundant material is available, it is difficult to reconcile the many varieties of taxonomic opinion and the diverse nomenclature employed by different authors. It is fairly generally admitted that hybridization accounts for some of the numerous variations, and since many elms clone readily hydrids may be widely distributed even in the absence of regular seed fertility.

There has been little detailed study of the elms of the Balkan Peninsula, chiefly owing to the lack of adequate material. The woody vegetation of this area is botanically the richest in Europe, and no clear idea of the taxonomy and history of *Ulmus* in Europe can be obtained till more is known of the genus in south-eastern Europe and Asia Minor. One of us (H. G. Tedd), resident in western Thrace, has made a collection of 95 sheets, from 24 trees on the Aegean coastlands to the foot of the Rodopes. The majority of the trees are represented by specimens of flowers, fruits, and leaves, collected at different times of the year. While the collection does not pretend to be exhaustive it is representative of the elm population of the district and serves as a basis for the following preliminary study.

It has proved difficult to apply names in the exact sense of original, or other, authors, even when published descriptions are sufficiently detailed to enable a proper comparison to be made. It is very probable that in *Ulmus* we have one of the many genera where the common system of taxonomic nomenclature is impracticable for detailed research. The difficulties of applying herbarium methods are enhanced in tree genera because of the frequent inadequacy of material, and the suggestion is merely made here that a scheme of symbolic description may be found more convenient than the application of names to innumerable "varieties." Such a scheme has been applied with success to the herbaceous species *Silene maritima*, *S. vulgaris*, and *Glaucium flavum*†. Since material is not yet available for such a revision as the adoption of a similar scheme in *Ulmus* would involve, we content ourselves with brief descriptions of the Thracian elms and an indication of their probable relationship to described species.

Most of the specimens can best be included within the species *Ulmus nitens*. The original description of this species (Moench, Meth. 333: 1794) reads: "foliis utrinque glabris ovatis: supra nitentibus: duplicato-serratis obliquis. *Ulmus carpinifolia*. Ehrhart." The name *U. carpinifolia* Ehrhart has not been traced beyond this reference. Hayek, Prodr. Flor. Penins. Balc. i. 91

---

*Continued from *Kew Bull.*, 1932, 454.

†See *Kew Bull.* 1928-1933, *passim*.

(1924) adopts the name *U. foliacea* Gilib. Henry, in Elwes and Henry, Trees of Great Britain and Ireland vii. 1887, footnote (1913), points out that this name cannot be identified with certainty, though it was probably based on an elm conspecific with *U. nitens*. Stearn and Gilmour (Journ. Bot. lxx. Suppl. 22: 1932) are similarly doubtful of the application of the name *U. foliacea* Gilib. Apart from its application the name appears to be illegitimate for nomenclatural reasons.

DESCRIPTIONS OF SPECIMENS.

Tedd 797: Bark coarse, much corky growth on younger branches. Current year's leafy twigs densely hairy becoming glabrous and greyish-brown later. Leaf buds ovoid, scales with more or fewer silky white adpressed hairs on the back and long white cilia. Flowering buds nearly spheroidal with long white silky pubescence usually in greater quantity than on the leaf-bud scales and with long white cilia. Leaves broadly elliptic or oblong-elliptic, apex narrowed to an acute acumen about 1 cm. long, base usually distinctly unequal, blade averaging 9 cm. long and 6·4 cm. broad, main teeth regular 3–4 mm. long, entire on shorter side, on longer side provided with 2–4 (usually 3–4) smaller teeth, about 10–14 veins on each side, upper surface with fine short pubescence all over but scarcely rough, lower surface of younger leaves with dense white soft pubescence, or older leaves with white soft pubescence all over but denser in vein axils and along the veins, also a few shortly stalked capitate glands; petiole 1 cm. long. Perianth lobes 5, ciliate. Stamens 5. Samara obovate, apical notch 2 mm. deep, lined with hairs, base cuneate, 1·8 cm. long, 1·2 cm. broad, seed above middle and often only just below apical notch.

The plant is too hairy for true *U. nitens* Moench, and is, indeed the most hairy of the collection. Possibly it represents merely one extreme of variation within the species, more doubtfully it may be of hybrid origin.

Boyadjiler, 17.2.32 (flowers), fruits and leaves later, hedgerows of pasture and arable land. Suckers from the roots.

Tedd 798: flowering material only. Perianth segments 5, ciliate. Stamens 5.

Boyadjiler, 17.2.32 (flowers), hedgerows of pasture and arable land.

Tedd 799: Corky bark. Second year's twigs reddish. Leaves broadly ovate, asymmetrically cordate, with main teeth entire or with up to 3 smaller teeth on one side, average of 2 smaller teeth on one side of each main tooth, averaging 8 cm. long and 4·5 cm. broad (up to 6·2 cm. broad), 9–13 veins, upper surfaces practically glabrous, very slightly rough, under surface pubescent all over not quite so densely as in 797, few stalked glands; petiole 1 cm. long. Perianth 5-lobed. Stamens 4. Samara broadly spherical-obovate, apical notch 3 mm. deep, 1·8 cm. long, 1·7 cm. broad, seed above middle.

Differs from 797 chiefly in narrower leaves, glabrous upper surface, less dense pubescence on under surface, broader samaras. Under *U. nitens* Moench.

Boyadjiler, 17.2.1932 (flowers), fruits and leaves later, hedgerows in pasture and arable land.

Tedd 800: Corky bark on twigs. Second year's twigs reddish. Leaves mainly with 2 smaller teeth on one side of each main tooth, broadest at or above middle, averaging 8·5 cm. long and 5 cm. broad, 12–16 veins, veins very close together, upper surface as in 797, lower as in 799; petiole 1·1 cm. long. Perianth most often 6-lobed. Stamens 4. Samaras pale shiny, elliptic to obovate-elliptic, apical notch 3–5 mm. deep, 2·4 cm. (up to 2·6 cm.) long, 1·6 cm. broad, seed slightly in upper half of fruit. Under *U. nitens* Moench.

Boyadjiler, 17.2.1932 (flowers), fruits and leaves later.

Tedd 801: Not corky. Second year's twigs reddish grey. Leaf and inflorescence buds very hairy. Leaf teeth mainly entire, some with one smaller tooth. Leaves elliptic or elliptic-oblong, averaging 7 cm. long and 3·5–4 cm. (up to 5 cm.) broad, upper surface with thinly scattered hairs all over, lower surface as 797, 11–15 veins; petiole 1 cm. long. Perianth 5–6-lobed. Stamens 4. Samaras oblong-obovate, apical notch 2 mm. deep, 2 cm. long, 1·3 cm. broad, seed well above middle. Under *U. nitens* Moench.

Boyadjiler, 17.2.1932 (flowers), fruits and leaves later, hedgerows in pasture and arable land.

Tedd 802: Bud scales more or less hairy with conspicuous white cilia. Only young leaves. Upper surface nearly glabrous. Lower surface with white axillary tufts of hairs, but otherwise nearly glabrous. Samaras broadly obovate-elliptic, apical notch 2·5 mm. deep, 1·8 cm. long, 1·4 cm. broad, seed above middle. Under *U. nitens* Moench.

Boyadjiler 17.2.1932 (flowers), fruits and young leaves later, hedgerows of pasture and arable land.

Tedd 803: Lower branches pendulous. Not corky. Leaves asymmetrically elliptic to broadly elliptic, main teeth mostly with 1–2 smaller teeth on one side, averaging 6·5 cm. long and 3·5–4 cm. (up to 5·7 cm.) broad, upper surface with relatively few scattered hairs, not rough, lower surface as in 799; petiole 1·1 cm. long. Perianth 5-lobed. Stamens 4. Samaras nearly spherical, apical notch 3 mm. deep, 1·5 cm. long, 1·4 cm. broad, seed slightly in upper half. Under *U. nitens* Moench.

Karakeuy, 20.2.1932. (flowers), fruits and leaves later, arable field at roadside.

Tedd 804: Not corky, white-grey bark, Leaves elliptic to obovate-elliptic, main teeth usually with 1–2 smaller teeth on one side, sometimes rather coarsely toothed, averaging 8·5 cm. long and 3·5–4 cm. broad, upper surface with few hairs and also slightly rough, under surface pubescent all over (less dense than 797) and with numerous shorter glands in addition; petiole 1 cm. long. Perianth

5-lobed. Stamens 4–5. Samaras elliptic (with scarcely any trace of being obovate), apical notch 3 mm. deep, 1·7 cm. long, 1·3 cm. broad. Possibly a hybrid with *U. nitens* for one parent.

Karakeuy, 20.2.32 (flowers), fruits and leaves later, hedgerow. Suckers from the roots.

Tedd 805: Marked corky growth. Leaves elliptic, rather long acuminate, main teeth mostly with 1–2 smaller teeth on one side, averaging 7·5 cm. long and 4 cm. broad, upper surface sparsely and finely hairy, not rough, under surface as 799; petiole 9 mm. long. Perianth 5–6-lobed. Stamens 4–5. Samaras very broadly elliptic, 1·6 cm. long. 1·5 cm. broad, seed just above middle. Under *U. nitens*.

Karakeuy, 20.3.1932 (flowers), fruits and leaves later, hedgerow. A young tree (15–20 years), suckers from the roots.

Tedd 806: Not corky. Leaves asymmetrically elliptic, main teeth entire or with one smaller tooth on one side, very few short hairs on upper surface, but not rough, lower surface as 799 with short glandular hairs also; petiole 7–10 mm. long. Perianth 5-lobed. Stamens 4. Samaras broadly obovate-elliptic, apical notch 2·5 mm. deep, 1·6 cm. long, 1·2–1·4 cm. broad, seed in upper half, almost to base of notch. Under *U. nitens* Moench.

Karakeuy, 20·2.1932 (flowers), fruits and leaves later; a group of 3 old trees solitary in field. No suckers seen.

Tedd 807: Not corky (?). Leaves broadly asymmetrically elliptic, main teeth rather broad and shallow, entire or with 1–2 smaller teeth on one side, 11–13 veins, upper surface with few scattered hairs and not rough, lower surface with axillary tufts of conspicuous white hairs and rather less soft pubescence between the main secondary veins than in 799; petiole 8 mm. long. Perianth 4–5-lobed. Stamens 4–5. Samaras obovate to nearly orbicular, notch with stigmata rather low down and wing curvature above stigmata pronounced, 3·5 mm. deep, 1·7–2 cm. long, 1·5 cm. broad, purplish above seed especially on one side, seed usually above middle. Under *U. nitens* Moench.

Sakarka, 2.2.1932 (flowers), fruits and leaves later, hedgerow. Probably no suckers.

Tedd 808: Not corky. Leaves broadly asymmetrically elliptic, teeth mainly simple, 11–13 veins, upper surface practically glabrous not rough, lower surface with conspicuous white axillary tufts of hairs but with few scattered soft hairs between secondary veins and fairly numerous glands, petiole 1 cm. long. Perianth 5-lobed. Stamens 4. Samaras obovate, apical notch 3 mm. deep, 1·9 mm. long, 1·5 cm. broad, seed in upper half up to base of notch. Under *U. nitens* Moench.

Sakarka, 21.2.1932 (flowers), fruits and leaves later, hedgerow.

Tedd 809: Not corky. Leaves mainly ovate, acute and scarcely acuminate, main teeth with 2–3 smaller teeth on one side only, 10–12 veins, averaging 6·5–7 cm. long and 4·5 cm. broad, upper surface with short adpressed pubescence, not rough, lower surface as 799; petiole 1 cm. long. Perianth 5–6-lobed. Stamens 4–5. Samaras oblong-obovate, notch 2·5 mm. deep, stigmata near apex of notch, 1·4 cm. long, 1 cm. broad (? not fully ripe), seed inserted well in upper half up to base of apical notch. More hairy than typical *U. nitens* Moench. Possibly a variety of *U. procera* Salisb. (*U. campestris* Auct.) or a hybrid.

Sakarka, 21.2.1932 (flowers), fruits and leaves later, hedgerow, row of trees.

Tedd 810: Not corky. Leaves mainly ovate, acute and scarcely acuminate, main teeth with 1–2 smaller teeth on one side only, 10–12 veins, averaging 4·6 cm. long and 3·4 cm. broad, upper surface with short evenly scattered pubescence, not rough, lower surface similar to 799; petiole 8 mm. long. Perianth 5-lobed. Stamens 4–5. Samaras oblong-obovate, notch 1·5–2·5 mm. deep, stigmata near apex of notch, 1·3 cm. long, 1 cm. broad, seed in middle half. Probably as No. 809.

Sakarka, 21.2.1932 (flowers), fruits and leaves later, hedgerow.

Tedd 811: Not corky. Glaucous bark of twigs. Leaves elongate-ovate, averaging 9 cm. long and 5·5 cm. broad, margin broadly toothed each main tooth with 2 to 5 smaller and rather irregular teeth on one side only, 10–12 veins, upper surface with short scattered pubescence, lower surface as 799; petiole 1–1·2 cm. long. Perianth 5-lobed. Stamens 4–5. Samaras obovate or elliptic-obovate, apical notch 2 mm. deep, 1·6 cm. long, 1·3 cm. broad, seed in middle half. Under *U. nitens* Moench.

Sakarka, 21.2.32 (flowers), fruits and leaves later, edge of field.

Tedd 818: Not corky. Leaves elongate-oblong to narrow elliptic, margin with mainly entire teeth, 14–16 veins on each side, upper surface with slight scattered pubescence and glands, lower surface with rather less pubescence between the secondary veins than in 799; petiole 6–7 mm. long. Perianth 5-lobed. Stamens 4. Samaras obovate to broadly obovate, apical notch 2·5–3 mm. deep, styles half way down, 1·3–1·4 cm. long, 1·2–1·3 cm. broad. *U. nitens* Moench var. *italica* Henry in Elwes and Henry, trees of Great Britain and Ireland vii. 1892 (1913).

Boyadjiler, 5.5.32 (leaves), arable land and pasture. Later in leaf than other specimens of elm, and bark apparently smoother.

Tedd 828: Young leaves asymmetrically elliptic, main teeth entire or with one smaller tooth on one side, upper surface of very short scattered hairs, probably becoming glabrescent, not rough, lower surface softly pubescent and with conspicuous axillary hair tufts. Perianth 5-lobed. Stamens 5. Samaras obovate, cuneate in lower part, apical notch 2 mm. deep, 1·4 cm. long, 9 mm. broad, seed in the upper half. Probably under *U. nitens* Moench.

Emirli, 200–300 m., 8.5.32 (young leaves and fruits), near stream side. Probably has suckers.

Tedd 127A: Corky. Leaves elongate-obovate, averaging 9·5 cm. long and 5 cm. broad, main teeth rather broad and irregular mostly with 1 to 3 smaller teeth on one side only, 10 to 12 veins, upper surface with scattered adpressed hairs, rough, under surface with white tufts in leaf axils and also a fairly dense soft pubescence between the veins with scattered glands; petiole 1 cm. long. Perianth 5-lobed. Stamens 4–5. Stigmata hairy all round. Samaras broadly obovate-elliptic, apical notch 1–1·5 cm. deep with the stigmata near its apex, 1·5 cm. long, 1·4 cm. broad.

Appears nearest to *U. hollandica* Mill. (*U. major* Sm.), which is supposed to be of hybrid origin by some authors, the upper leaf-surface is, however, rough.

Kizildjakeuy, sea-level, 2.3.1930 (flowers), leaves later, near the shore of Lake Boru, in copse-land. 25–50 ft., suckers.

Tedd 127B: Not corky (?). Leaves elliptic to elliptic-obovate averaging 9·5 cm. long and 6 cm. (up to 7 cm.) broad, upper surface with few or no scattered adpressed hairs, rough to nearly smooth, lower surface with axillary tufts of white hairs, but between the veins nearly glabrous, few glands; secondary veins 9–12; petiole 5–6 mm. long. Perianth 5-lobed. Stamens 4. Nearest to *U. hollandica*. Mill.

Kizildjakeuy, 2.3.1930, farther inland than 127A, in hedgerows. Suckers.

Tedd 127C: Leaves asymmetrically elliptic, averaging 7·5 cm. long and 4·5 cm. broad, teeth entire or with 1 smaller tooth on one side, 12–14 veins, upper surface glabrescent or with few adpressed hairs, lower surface with white axillary tufts of hairs and pubescence between and on the veins with few intermixed glands; petioles 1 cm. long. Perianth 5-lobed. Stamens 4–5. Possibly a hybrid with *U. nitens* Moench for one parent.

Kizildjakeuy, 2.3.1930 (flowers), leaves later. From an old and much mutilated tree.

Tedd 127D: Flowering material only.

Denkler, 2.3.1930, in a Turkish cemetery.

Tedd 127E: Leafy material and samaras only. Leaves asymmetrically elliptic to ovate-elliptic, averaging 7·5 cm. long and 4·7 cm. broad, main teeth with 1–2 smaller teeth on one side only, 11–15 veins, upper surface glabrous or nearly glabrous, lower surface with axillary tufts of white hairs and short scattered pubescence on and between the secondary veins, petiole 1·1–1·2 cm. long. Samaras broadly elliptic to elliptic-obovate, apical notch 2·5–3 mm. deep, stigmata half-way down, 1·4 cm. long, 1·2–1·3 cm. broad. Under *U. nitens* Moench.

Near Ferizli, 1930.

Tedd 127F: Pollarded shoots only, leaves with persistent stipules. Leaves elongate-elliptic, averaging 10·5 cm. long and 5·5 cm. broad, main teeth rather broad and with usually 1–2 smaller teeth on one side only, upper surface nearly glabrous and not rough, under surface with axillary tufts of white hairs and short pubescence on and between the secondary veins mixed with glands; petioles up to 2 cm. long. Probably under *U. nitens* Moench.

Ferizli, 1930.

Tedd 127G : Sucker shoots. Young branches densely pubescent. Leaves small, many very small, averaging 2·8 cm. long and 2·7 cm. broad but varying much in actual size, 7–10 veins, main teeth very irregular entire or with 1–2 smaller teeth on one side only, upper surface very rough with asperous hairs and glands, lower surface thickly pubescent and with glands ; petioles 1–2 mm. long, leaves nearly sessile. Impossible to place with certainty. In many characters resembles specimens from Jersey, in Herb. Kew., named *U. stricta* var. *sarniensis*.

On sands near the sea at the mouth of the River Mesta, 1930.

It is hoped that the above descriptions will call attention to the need for further investigations of the elms of the Balkan Peninsula and will stimulate collectors to send good sets of specimens to Kew. It is only after carefully collected material from many areas has been examined that a definite nomenclature can be suggested. In Thrace the timber of the elm is called " Kara-agatch," i.e. black wood, in Turkish. The wood has the reputation, as elm wood elsewhere, of being very water resistant. No information has been obtained to show that carpenters, etc., distinguish different kinds. Most of the trees are regularly pollarded, which makes it difficult to find a tree showing its normal form.

While this paper was passing through the press, the following supplementary field-notes were received from Mr. Tedd :—

Tedd 797 : Bark corrugations about 3 cm. deep and 2·5 cm. wide, bark tending to split vertically rather than horizontally. Fair amount of corky excrescence ; colour of branches rusty-grey with striations parallel to length. Leaves (at 3 Dec.) yellow and brown but mostly still on tree. Main twigs stout with obtuse-angled branching. Suckers. Circumference of trunk at 1·5 m. is 2·62 m.

Tedd 798 : Bark corrugations about 2 cm. deep and 2 cm. wide, 2–3 cm. intervals. Branches rusty-grey without striations. Corrugations of bark (of trunk) with vertical tendency. Suckers. Circumference of trunk at 1·5 m. is 2·14 m.

Tedd 799 : Bark with vertical splits, corrugations 1·5 cm. deep, 2·5 wide, 2–2·5 cm. intervals. Branches grey with pronounced reddish cross-lenticels. No cork now visible. Suckers. Leaves almost all fallen. Young twigs fairly stout. Circumference 1·5 m.

Tedd 800 : Corrugations vertical, 2 cm. deep, 2 cm. wide, 2–3 cm. intervals ; corky growth on branches ; branches and twigs reddish. Suckers. Pollarded this year, green and yellow leaves still remaining, very few fallen. Circumference 2·26 m.

Tedd 801 : Vertical corrugation of bark. Branches and twigs reddish-grey, smooth, no striations, twigs stout. Suckers. No cork. Pollarded this year, few leaves yet fallen, mostly yellow now. Circumference 2·14 m.

Tedd 802 : Very gnarled trunk, probably tending to cross-corrugated type. Corky, branches greyish, young twigs and branches not so regularly obtuse-angled. Suckers.

Tedd 807: Gnarled trunk. Suckers. No cork. Branches greyish, twigs stout with typical obtuse-angled branching. Bark corrugations with vertical tendency; no leaves left on now; prominent cross-lenticels; tough bark on twigs.

Tedd 808: Young tree, 60 cm. round at 1·5 m. Suckers. No cork, branches grey, no striations, no prominent lenticels. Leaves nearly all fallen.

Tedd 809: Bark corrugations markedly of vertical type, corrugations 1–1·5 cm. deep, 1–3 cm. wide, average about 2 cm. Mature bark smoother than preceding. Branches with grey bark, smooth, twigs more delicate, acute-angled branching, pendulous at extremities. Suckers. No. cork. Leaves about half fallen, remainder yellow. Circumference of trunk 1·65 m. at 1·5 m. height from ground.

Tedd 810: Young tree, circumference 64 cm. Smooth grey bark, same type as No. 809. Corrugations on trunk just becoming characteristic, 30–40 mm. deep, 1 cm. wide, 50 mm. intervals, twigs delicate with acute-angled branching. No cork. Suckers probably, but it is possible that this young tree is itself a sucker. Leaves practically all shed.

Tedd 811: Smooth-trunk type, corrugations 1–1·5 cm. deep, 2 cm. wide, 1–1·5 cm. intervals. Vertical type of corrugations. Suckers. No cork; branches grey. Leaves mostly still on tree. Pollarded this year (summer). Twigs stout, with obtuse-angled branching. Circumference 1·82 m.

Tedd 818: Corrugations of trunk of cross-type, very rough, 3 cm. deep, width 4 cm. Branches and twigs greyish, with mostly slender young twigs with acute-angled branching. No cork. Suckers. Leaves yellow and brown and mostly fallen. Circumference at 1·5 m. is 2·62 m.

Corrugations of trunk. There are two types usually fairly distinct, and often clearly so. They are difficult to describe but easily recognised—the obvious difference being the presence or absence of horizontal splits in the old bark (described as horizontal or vertical type above).

Branching of twigs. Here there are also two characteristic types; the obtuse-angled is well shown by No. 805, and the acute by No. 806 (see specimens). The obtuse-angled type is commoner, and is mostly well shown in the outer and upper twigs, which stand out very clearly in winter.

Seedlings. It is possible that these are more frequent than one would suppose. Others have now been found in Xanthie on the roof of an old Turkish bath.

Bark of young branches. This seems to be quite different from the common English elm. It is very tough, and if a young branch is broken the bark tends to peel up the branch rather than break. The wood is also tougher than the English elm.

Diseases. No sign has been seen of anything which might be Dutch elm disease. A rust parasite which causes galls on the young branches infects many trees, especially those with corky bark.

Age. A trunk 1·5 m. in circumference showed 98–100 growth rings.

XXXI—DIOSCOREAE NOVAE ASIATICAE.

Dioscorea (Stenophora) Poilanei *Prain et Burkill*; species e grege *D. deltoideae* Wallich, et *D. Prazeri* Prain et Burkill, capsulis nitidis, intense aeneis et conspicue majoribus facillime discriminanda.

Caulis partes inferae cum partibus hypogaeis nondum visae, sed partes hypogaeae narcoticae et (teste Poilane) ad piscandum idoneae; partes superae lentae, glabrae, nitidae, leviter lineatae, 1·5 mm. diametientes, sinistrorsum volubiles. *Folia* alterna, tenuia, alte cordata vel subsagittata lobis basalibus rotundatis, margine minopere sinuata, apice brevius acuminata, 5–7-nervia: nervi paris primoris aream late ellipticam concludentes: nervi paris alterius vix ad mediam laminam extensi: nervi secundarii quam reticulatio vix magis conspicui: pagina supera glabra, nitida, nervis nervulisque parum elevatis: pagina infera glabra, vix nitida, nervis primariis distincte elevatis, ceteris cum nervulis paginae superae conformibus: folia maxima adhuc visa ad 10 cm. longa, ex adverso apicis petioli atque inter apices loborum basalium 6 cm. lata: petiolus nonnunquam stipulis parvis aculeiformibus armatus, 6 cm. longus. *Flores maris* ignoti: *feminae* in spicis brevibus pendulis dispositi. *Sepala* ovata, 1-nervia, nervo in carinam posticam elevato, 1·25 mm. longa. *Petala* quam sepala latiora et magis obtusa. *Capsulae* aeneae, politae, reflexae, imbricatae, stipite curvato et sursum minopere in alis expanso 5 mm. longo suffultae: alae ex apice stipitis usque ad vel saepius ultra mediam capsulam expansae: capsulae apice truncatae, ibique saepe vix angustiores quam ad partem latissimam, secus placentam 28–32 mm. longae, alis ad 15 mm. usque latis. *Semina* circumcirca alata: ala pallide hyalina.

ANAM BOREALE. In provincia Quang-Tri, apud Lang-Vieng-Ap ad 400 m., *Poilane* 10843 (typus, in Herb. Paris).

Dioscorea (Paramecocarpa) Petelotii *Prain et Burkill*; species ad *D. flabellifoliam* Prain et Burkill, proxime accedens, sed pubertate, capsularum magnitudine et praesertim foliorum forma apte distinguenda.

Partes hypogaeae adhuc ignotae. *Caulis* sinistrorsum volubilis, lineis elevatis perdistincte notatus, ad petiolorum insertiones aculeolis saepius binis nonnunquam ternis quaternisve obsitus, in regione florigena ad 3 mm. crassus, primo pilis minutis fulvastris mox deciduis obtectus. *Folia* alterna, simplicia, elongato-subdeltoidea, angulis basalibus rotunda: lamina prope basim ad 9 cm. lata, secus nervum medium ad 13 cm. longa, sub acumine 15 mm. longo plus minusve rotundata, 7-nervia, nervis paris primoris a nervo medio sub angulo 40° diametienti excurrentibus aream intranerviam late oblanceolatam concludentibus, iis paris alterius a nervo medio sub angulo 75° diametienti divergentibus et versus mediam partem laminae marginis vel paulo ultra aequabiliter curvatis; nervi secundarii anfracti areas intra nervos primarios inclusas perlustrantes quam reticulatio vix magis conspicui: pagina superiore glabra, fere nitida, nervis reticulationeque conspicuis aliquantulum elevatis: pagina inferiore pallidiore ad petioli insertionem et secus latera nervorum praecipuorum prominentium pilis minutis fulvastris induta: nervi primarii subtus prominentes, secundarii elevati: petioli ad 7 cm. longi, pilis minutis fulvastris tomentosi: pulvini non modo inferiores sed etiam superiores elongati. *Flores maris* ignoti. *Flores feminae* racemosi—racemum vidimus singulum flores octo gerentem, in his tres tantum fructuosi: axis racemi more petiolorum pilis minutis fulvastris lanuginosus: bracteae a basi lata ovatae, acutae, 2 mm. longae: pedicelli floriferi 3 mm. longi: ovarium ad 7 mm. longum. *Sepala* a basi lata ovata, uni-nervia, 1·5 mm. longa. *Petala* latiora. *Staminodia* minuta. *Stylorum* brachia tria, apice bifurcata. *Capsula* stipite 7–10 mm. longo suffulta: stipes sursum incrassatus atque ad capsulae basin 2 mm. latus: alae ab apice stipitis ad angulam 90° diametientem divergentes, marginibus subparallelis atque ob eam causam capsula cum longitudine secus placentam 60 mm. metiente latitudinem ad basim atque sub apicem rotundatum 7 mm. sed in mediam partem 10 mm. metiente ostendit. *Semina* circumcirca alata sed margine apicem capsulae spectante distincte latiore quam margo basim spectans, in quoque loculo parum remota, inferius ad 10 mm. supra basin placentae, superius versus mediam placentam affixum.

TONKIN. Provincia Lao-Kay, inter Cha-pa et Muong Hoa ad 1400 m., in mense Augusto fructigena, *Pételot* 4.395 (typus, in Herb. Kew.).

Dioscorea (Illigerastrum) dissimulans *Prain et Burkill*; species capsulis et seminibus cum eis specierum sectionis *Stenophorae* conformibus, sed ob folia ternata foliolo centrali palmatim venoso et ob flores ambitu orbiculares una cum *D. simulante* Prain et Burkill, *Illigerastris** ascribenda: vix cum ceteris *Dioscorearum* asiaticarum

---

***Illigerastrum** *Prain et Burkill*; generis *Dioscoreae* sectio nova capsulis seminibusque cum sectione *Stenophora* congruens et foliis aliquantum cum sectione *Lasiophytoni* congruens, sed floribus a sectionibus omnibus Asiaticis generis plane distincta. *Caulis* sinistrorsum volubilis. *Folia* alterna, trifoliata: foliolum medium trinerve, nervis paris primoris apicem ut videtur eglandulosum attingentibus: foliola lateralia petiolulata, ex relatione ad nervum primarium oblique asymetrica. *Flores* maris (in *D. simulanti* tantum adhuc noti) in cymulis parvulis aggregati. *Cymuli* secus axin inflorescentiae racemosim dispositi et versus rhachidis apicem ad flores singulos reducti. *Perianthium* sub anthesin ambitu plus minusve orbiculare. *Stamina* 6. *Flores feminae* in racemis simplicibus spiciformibus dispositi, perianthio ambitu plus minusve orbiculari. *Capsulae* reflexae, alis quam latis parum longioribus. *Semina* circumcirca alata.—Species 2, altera Chinae australis, altera Anam borealis incolae.

comparanda : a *D. simulante*, ob folia subcoriacea foliolis lateralibus apice rotundatis apte distinguenda.

Caulis sinistrorsum volubilis, ad 6 m. altus (teste Poilane) : partes superae tantum visae, firmae et lentiores, glabrae, leviter lineatae: caulis partes inferae cum partibus hypogaeis adhuc ignotae. *Folia* alterna, trifoliata, subcoriacea: foliolum medium ovato-ellipticum, basi obtusum, apice acutum nec acuminatum, ad 8 cm. longum, ad 3·5 cm. latum, 5-nerve : nervi paris primoris aream oblanceolatam concludentes: nervi paris alterius fere submarginales: nervi secundarii aream intranerviam vix manifeste transcurrentes sed nervulis aeque distinctis nervis primordiis parallelis et ab his enatis sese immiscentes : pagina supra glabra, nitida, nervis nervulisque distinctis, infra nervis nervulisque magis prominentibus: foliola lateralia ad 5·5 cm. longa, ad 2·5 cm. lata, ex relatione ad nervum primarium tantum asymetrica ut partes extra nervum formam folii ovati dimidiati, eae intra nervum formam folii oblanceolati dimidiati in memoriam revocant, apice rotundata, ad basin versus in petiolulum 3 mm. longum attenuata: petiolus glaber, ad 3 cm. longus. *Flores maris* adhuc ignoti : *feminae* pedicellati in racemis pendulis dispositi : axis racemi fere rectus, glaber, lineis elevatis notatus, ad 15 cm. longus : pedicellus unusquisque stipite proprio suffultus, sub anthesin cum stipite 2–3 mm. longus, demum reflexus : bracteae ad conjunctionem pedicelli cum stipite, lanceolatae, 1 mm. longae. *Sepala* lanceolato-ovata, subhorizontalia, vel apice minopere decurva et marginibus apicem versus recurvis, minute velutina, 2·25 mm. longa. *Petala* sepalis conformia sed sub anthesin plenum adscendentia. *Staminodia* 3, petalis opposita. *Stigmata* e paribus 3 labiarum curvatarum composita. *Capsulae* reflexae, aeneae, pernitidae : pedicellus cum stipite nunc ad 8 mm. longus, sutura placentalis 25–28 mm. longa : alae supra medium ubi latissimae 18 mm. latae, apice truncatae. *Seminis* corpuscula 8 mm. longa 5 mm. lata, circumcirca alata : ala pallide brunnea.

ANAM BOREALE. In provincia Quang-Nam : apud Ba-na prope Tourane, ad 1200 m., *Poilane* 7242 (typus, in Herb. Paris.).

Dioscorea (Lasiophyton) filicaulis *Prain et Burkill*; species inter affines minima, *D. arachidnae* Prain et Burkill, proxima.

Tubera ignota. *Caulis* pergracilis, glaber vel pilis perpaucis ad innovationes minutissime indutus, sinistrorsum volubilis. *Bulbilli* ignoti. *Folia* alterna, trifoliata, supra glabrescentia, hebetia, infra pilis sparsis albis obsita : foliolum medium elliptico-lanceolatum vel subovatum, basi subacutum, apice acutum mucronulatum, nervis pinnatis : foliola lateralia inaequilatera—omnia 6 cm. longa, ad 2·2 cm. lata : petiolus ad 2 cm. longus. *Flores maris* ignoti. *Flores feminae* in spicis unicis axillaribus decurvatis dispositi : axis minute pubescens, deinde glabrescens, 0·5 mm. diametiens : bracteae ovato-lanceolatae, ovarii basin amplectentes, 1 mm. longae. *Sepala* ovato-orbicularia, glabra, 0·75 mm. longa. *Petala* conformia, nisi minora et tenuiora. *Staminodia* minuta.

Capsulae reflexae : stipes 1 mm. longus : alae semi-ellipticae, apice rotundatae, ad 13 mm. tantum longae, ad 5 mm. latae. *Semina* basin versus alata.

SIAM. In comitatu Rachasima, ad Aran Pratet, *Put* 2087 (typus, in Herb. Kew.) ; in comitatu Nakawn Chaisi, apud Dom Bang, Supan, *Kerr* 19702 a.

Dioscorea (Enantiophyllum) Potanini *Prain et Burkill* ; species e grege *D. oppositae* Thunb. et *D. japonicae*, Thunb. ; ab ambabus differt foliis crassitudine tenuioribus, propter auriculas basales rotundatas conspicuas fere trilobis.

Planta omnino glabra. *Tubera* adhuc ignota. *Caules* graciles, parum cristati, dextrorsum volubiles. *Bulbilli* adhuc ignoti. *Folia* tenuia, opposita vel perraro terna, propter auriculas fere tripartita, 7-nervia ; laminae parte centrali lineari-lanceolata ad 7 cm. longa, auriculis basalibus a lateribus ex transverso expansis, ad 2 cm. diametro : areola intranervia interior clausa anguste lineari-lanceolata : pagina superior levis, nervis distinctis : pagina inferior similis sed nervis primariis paululum prominentibus : petiolus quam lamina dimidio brevior. *Spicae maris* 2–4-nae, axillares : axis ad 3 cm. longus, plus-minusve 20-florus, pertenuis, leviter inflexus : bracteae ovato-lanceolatae, vix reflexae. *Sepala* ovata, 1 mm. longa vel paululo longiora. *Petala* sepalis minora. *Stamina* sex. *Florum feminae sepala* ovata, vix 1 mm. longa. *Petala* sepalis minora. *Capsulae* pallidae, stipite 2 mm. longo : alae quam semicirculus latiores, 14–15 mm. longae, 10 mm. latae. *Semina* circumcirca alata, loculo conformia, rufo-fulvescentia.

CHINA. In provinciae Ho-nan comitatu Teng-fong Hsien, ad 670 m., *Schindler* 143 ; in provincia Hu-peh, Nan-t'o vel boream versus, *Henry* 2023 ; in provincia Sze-chuan, in monte Omi, *Potanin* (typus, in Herb. Petropol.) ; in provinciae Yun-nan comitatu Kaing-you Hsien, in montibus Kuan-wu Shan ad 1300 m., *F. T. Wang* 22242 ; ad Mo-so-yn, *Delavay*.

Dioscorea (Enantiophyllum) intempestiva *Prain et Burkill* ; species e grege *D. cirrhosae* Loureiro, quoad foliorum figuram et capsularum formam cum *D. laurifolia* Wallich, ad amussim congruens : sed foliis exsiccatis rubentibus, alabastris basi latioribus, spicis maris exadverso geotropicis, et praesertim habitudine floripara atque fructifera qua tempestate species ceterae sectionis *Enantiophylli* cognatae pullulant manifeste differt.

Tubera nobis ignota, sed (teste Poilane) foris rubescentia ad vescendum apta vix tamen esculenta. *Caulis* dextrorsum volubilis ad 12 m. usque altus : partes superae tantum visae inermes, glabrae, lentae, leviter lineis longitudinalibus notatae, ad 5 mm. diametientes. *Folia* exsiccata rubentia, alterna vel rarius opposita, coriacea, anguste ovata vel ovata, basi obtusa vel rotundata, apice breviter acuminata, saepissime ad 10 cm. longa, saepius ad 4 cm., interdum ad 6 cm. lata, 5-nervia vel quandoque 7-nervia : nervi paris primoris a nervo centrali ad angulum 30° metientem divergentes aream late oblanceolatam versus apicem acuminatam concludentes : nervi paris alterius in foliis 5-nervibus ad angulum 60° metientem a nervo centrali divergentes sub marginem paginae ad apicem folii usque percurrent : nervi secundarii areas internervias saepius recte sed subinde anfractuose transcurrentes, semper tamen reticulatione conspicue implicati : margine distincte aucto : facie supera glabra nervis omnibus prominulis : facie infera nervis primariis prominentibus, ceteris prominulis : nervis majoribus rubentibus. *Flores maris* in spicis dispositi : spicae (an semper) axillares : axis angulosus, ad 4 cm. longus : bracteae ovato-acuminatae, sub basin alabastri explanatam retrusae, 1 mm. longae ; bracteolae latissime deltoideae. *Sepala* quadrato-ovata, obtusa, 1·25 mm. longa. *Petala* ovata, sepalis breviora. *Stamina* 6, 0·5 mm. longa, antherae quam filamenta parum longiores. *Gynoecium* parvum, 3-punctatum. *Flores feminae* secus spicas pendulas dispositi : axis spicae glaber, angulatus : bracteae ovato-subulatae, 1 mm. longae. *Sepala* crassa, late ovata, 1 mm. longa. *Petala* crassa, sub-obovata, 0·75 mm. longa. *Stigmata* e paribus hamorum 3 composita. *Capsulae* stipitatae in spica singula ad 16 usque, hebetes, fulvae : stipes ad 5 mm. longus, sursum explanatus ad 4 mm. diametiens : alae ad apicem truncatum fere aequabiliter curvatae, secus placentam 22–26 mm. longae, ubi latissimae 18–20 mm. latae. *Semina* loculis conformia, circumcirca alata : ala brunneo-rubescens.

ANAM BOREALE. In Provincia Quang-Tri, in montibus Dong-Tain-Ve ad 700 m., *Poilane* 10825 ; apud Lang-Vieng-Ap, *Poilane* 10879 (typus) ; in montibus Dong-Cho ad 600 m., *Poilane* 10717, 11246 ; apud Mai-Lanh ad 400 m., *Poilane* 10440. Exempla omnia in Herb. Paris.

Dioscorea (Enantiophyllum) Bonii *Prain et Burkill* ; species *D. cirrhosae* Loureiro, proxima, alabastris globosis, floribus minoribus, et foliis herbaceis subtus pruinosis facile distinguenda.

Caulis dextrorsum volubilis, partes inferae et hypogaeae nondum obviae : partes superae inermes, 5 mm. diametientes ramos laterales 3–4 mm. diametientes emittentes : rami rigidi primo foliis alternis denique foliis oppositis vel quandoque ternariis suppediti, glabri, lineis in longitudinem leviter elevatis induti. *Folia* nunc lanceolata, nunc late lanceolata, basi obtusa vel rotundata, apice acuta vel aliquatenus acuminata, ad 8 cm. longa et subinde ad 2·5 cm. sed saepius 1·5 cm. tantum lata, 3–5-nervia : nervi paris primoris a nervo centrali ad angulum 30° metientem divergentes et aream lanceolatam concludentes : nervi paris alterius a centrali ad angulum 60° metientem emissi in partem laminae basalem dilapsi : nervi secundarii aream intranerviam more anfracto transcurrentes : pagina supera glabra, hebetia, levia, nervis primariis distinctis ceteris vix manifestis : pagina infera nervis primariis prominentibus exceptis pruinosa, nervis secundariis manifestis sed reticulatione vix conspicua : petiolus 2 cm. longus. *Flores maris* in spicis dispositi :

spicae secus axin inflorescentiae efoliatae ad 8 cm. sed saepius 4 cm. tantum longum instructae: axis inflorescentiae angulosus, glaber: spicae internodiis inflorescentiae longiores: alabastra globosa: bracteae lanceolatae, 1 mm. longae, a basibus alabastrorum repressae: bracteolae triangulares, 0·5 mm. longae. *Sepala* ovata, glabra, 1 mm. longa. *Petala* obovata, sepalis paululum breviora. *Stamina* 6, 0·5 mm. longa, filamentis perbrevibus.

TONKIN OCCIDENTALE. Loco incerto, *Bon* 4321 (typus, in Herb. Paris.).

Dioscorea (Enantiophyllum) lamprocaula *Prain et Burkill*; species inter orientales sectionis apte distinguenda caulibus stramineis valide aculeatis, foliis coriaceis, inflorescentiis elongatis, alabastris obovoideo-pyriformibus.

Planta omnino glabra. *Tubera* ignota. *Caules* straminei ad 7 mm. crassi, dextrorsum volubiles, aculeis 3–4 mm. longis armati. *Bulbilli* magni, pyriformes vel digitati. *Folia* alterna, coriacea, marginata, 5–7-nervia: majora latissime ovata, ad 17 cm. longa, ad 13 cm. lata, vel subinde fere orbicularia: areola intranervia interior clausa elliptico-ovata: folia media anguste ovata, ad 11 cm. longa, ad 6 cm. lata: pagina superior nervis elevatis modice distinctis: pagina inferior similis nisi pallidior, nervis minoribus sed primariis prominentibus: petiolus laminae dimidio vix aequilongus. *Flores maris* in inflorescentias aphyllas elongatas congregati: spicae ab axin divergentes, ad 5 cm. longae; bracteae triangulari-ovatae, 0·5 mm. longae, mucronatae, opere floris basis vix repressae: alabastra globosa. *Sepala* 1·25 mm. longa, obovata, apice rotundata, incurvata, fere 1 mm. lata. *Petala* sepalis minora, orbiculari-obovata, apice rotundata, 0·75 mm. lata, vix opaca. *Stamina* sex, 0·5 mm. longa. *Flores feminae* ignoti.

SUMATRA. In provincia "East Coast" nuncupata, Sibolangit ad 500 m., *Lörzing* 5158 (typus, in Herb. Hort. Bot. Buitenzorg); Bukit Semaik, prope Sibolangit, *Mohamed Nur* 7376.

MALAYA. In principatu Perak, in cacumine Gunong Hijau, altitudine 1256 m., *Mohamed Haniff et Mohamed Nur* 2454; in principatu Pahang, apud speluncas Kota Glanggi, *Henderson*: in principatu Johor, ad rivos fluminis Sedili, *Corner*.

Dioscorea (Enantiophyllum) depauperata *Prain et Burkill*; species ut videtur calcicola, ex affinitate *D. alatae* Linn., eamque maxime spicis flexis accedens sed spicis singulis paucifloribus in axillis sitis nec in inflorescentias aggregatis.

Planta omnino glabra. *Tuber* unicum alte in terram descendens, carne album ad vescandum aptum. *Caules* basin versus angulati, colore cuprei, dextrorsum volubiles. *Bulbilli* adhuc ignoti. *Folia* nisi ima et superiora opposita, hastata vel auriculato-hastata vel subsagittata vel minima subovata, 5–7-nervia: majora 8 cm. longa 5 cm. lata: areola intranervia interior clausa lanceolata: pagina superior hebes, nervis primariis distinctis: pagina inferior pallidior,

nervis rufescentibus elevatis : petiolus parum alatus quam dimidium laminae paululo longior. *Spicae maris* fere semper in foliorum vel bractearum axillis sitae nec in inflorescentias proprias aggregatae : axes flexi, plus minusve 10-flori. *Alabastra* globosa : bracteae ovatae, subacuminatae, 0·75 mm. longae. *Sepala* ovata, perobtusa, 1·25 mm. longa, basin versus dorso cristata, marginibus tenuia. *Petala* obovata, crassa, 1 mm. longa. *Stamina* sex. *Spicae feminae* axillares, plus minusve 10-florae : bracteae ovatae. *Sepala* rotundato-ovata, 1 mm. longa. *Petala* similia nisi minora. *Capsulae* colore cupreae : stipes 3–4 mm. longus : alae fere semicirculares, sed apice retusae, 15 mm. longae, 8 mm. latae vel paulum majores.

SIAM. In comitatu Rachaburi, prope Kanburi in collibus calcareis, Sai Yok, versus 500 m., *Marcan* 2400, *Put* 1804. Kao Tawng, infra 100 m., *Kerr* 19643, 19647, 19648 (typus, in Herb. Kew.); in comitatu Rachasima, ad Aran Pratet, *Put* 3128.

LAOS. In comitatu Saravane, ad Samia, *Poilane* 18495.

XXXII—AFRICAN ORCHIDS : V.* V. S. SUMMERHAYES.

Cynorchis debilis *Summerhayes*, comb. nov. *Habenaria debilis* Hook. f. in Journ. Linn. Soc. Lond. **7**, 221 (1864).

It seems clear on examination of this species that it is correctly placed in *Cynorchis*. Features supporting this view are the glandular pubescent scape and ovaries and the five-lobed lip. This latter has been described previously as three-lobed but in addition to the three main lobes there is also a small tooth-like lobe on each side near the base. In *C. Johnsoni* Rolfe, which also has a five-lobed lip, the basal lobes are shorter than the others and *C. debilis* may be considered as showing a further reduction from this towards a three-lobed lip. The other features of the flower also agree with *Cynorchis*, the stigmas being partially united to the side lobes of the rostellum.

Habenaria occidentalis *Summerhayes*, comb. nov. *Amphorchis occidentalis* Lindl. in Journ. Linn. Soc. Lond. **6**, 139 (1862). *Cynorchis occidentalis* Dur. & Schinz, Conspect. Fl. Afr. **5**, 92 (1892).

An examination of the type specimen of this species shows that its correct position is not in the genus *Cynorchis*, but that it belongs to a group of species placed in the genus *Habenaria* and remarkable for their inverted, hairy flowers. These species, namely, *H. villosa* Rolfe, *H. aberrans* Schltr. and *H. Snowdenii* Summerhayes are placed in the section *Diphyllae* and *H. occidentalis* agrees in possessing the broad adpressed radical leaf characteristic of the species of this section. The species differs from all species of *Cynorchis* known to me by possessing bilobed petals, a feature which it shares with the *Habenaria* species mentioned above, although in *H. occidentalis* the petals are divided only at the apex. The orange flowers are another feature militating against its inclusion in *Cynorchis* since that genus possesses usually pink or purplish more rarely white ones.

---

*Continued from *K.B.* 1932, 344.

In all the species the rostellum middle-lobe, although slightly concave, is very similar to that in many other species of *Habenaria*. *H. occidentalis* is characterised by the presence of a thickened ridge or keel running down the centre of the lip.

I have already given a key to the species of this group (*Kew Bull.* 1931, p. 381). *H. occidentalis* may be separated from the remainder as follows :—

Lip trilobed for a quarter of its length, lobes 1·5–2 mm. long ; spur erect, somewhat incurved, 15 mm. long...*H. occidentalis*.

Lip trilobed to the middle or below, lobes 4 mm. or more long ; spur erect, 8–9 mm. long, or pendulous, 15 mm. long........... *remainder of species* (see key).

Habenaria malacophylla *Rchb. f.* in Otia Bot. Hamburg. **2,** 97 (1881). *H. Holstii* Kraenzl. in Engl. Jahrb. **19,** 246 (1894). *H. pulla* Schltr. in Engl. Jahrb. **55,** 497 (1915).

An examination of the type specimens of these three species, as well as specimens from other localities such as Abyssinia and the Virunga Mountains, has convinced me that they must be referred to one species. The variations found are such as might be expected to occur in a widely spread species, but allowing for these the structure of the flowers is really remarkably uniform. The species as here delimited is consequently distributed from Eritrea in the north through East Africa to Natal and Griqualand East. It is an inhabitant of forests which doubtless accounts for the relatively large gaps in our knowledge of its exact distribution within the general outline given above.

It should be noticed that *H. Holstii* is included in the Flora of Tropical Africa among those species with narrow leaves (see key, p. 209) and is thus widely separated from *H. malacophylla* in the enumeration of the species. However, in the description on p. 238 the leaves are given as being " 1¼–2 in. broad " which measurements are actually greater than those given for *H. malacophylla*, viz. 8–12 lin., although in length there is little to choose between the two species. A similar error has been made in the key with respect to *H. Buettneriana* Kraenzl., which is a closely allied species differing in the reflexed dorsal sepal and more slender spur.

Habenaria petitiana *Durand & Schinz*, Conspect. Fl. Afr. **5,** 83 (1892). *Herminium Steudneri* Rchb. f. Otia Bot. Hamburg. **2,** 109 (1881). *Platanthera volkensiana* Kraenzl. in Engl. Pflanzenw. Ost.-Afr. C. 151 (1895). *Peristylus Snowdenii* Rolfe in Kew Bull. 1918, 237. *P. ugandensis* Rolfe, l.c.

Examination of the type specimens or authentic material of the above species makes it clear that they should be referred to one species. The species have all been placed in the genus *Peristylus* Bl. by Rolfe but an investigation of the African and Indian species of this genus has convinced me that it cannot be maintained as distinct from *Habenaria*. The very short stigmas, absence of anther

canals and other supposedly distinguishing characters can be found in species of *Habenaria* which in other respects are very similar to the species included in *Peristylus*. Such, for instance, is the group of species allied to *Habenaria Rendlei* Rolfe on the one hand, and the group centred around *H. malacophylla* Rchb. f. on the other.

The following new combination is necessary in view of the above decision :—

Habenaria brachylobos *Summerhayes*, comb. nov. *Peristylus brachylobos* Summerhayes in Kew Bull. 1931, 382.

Habenaria (§ Cultratae) Tweedieae *Summerhayes*, sp. nov. ; affinis *H. cultriformi* Kraenzl. et *H. incomptae* Kraenzl., a quibus sepalis lateralibus semi-ovatis vel semi-orbicularibus subacutis nec lateraliter apiculatis, sepalo intermedio longiore, petali partitione postica haud fimbriata, partitione antica basi haud subito dilatata, rostelli lobo intermedio antheram bene superante differt.

Herba terrestris, robusta, erecta, 45–60 cm. alta ; tuber elongato-ovoideum, 4 cm. longum, ultra 1 cm. diametro. *Caulis* teres, basi cataphyllis paucis instructus, 6–8-foliatus. *Folia* lanceolata, acuminata, basi vaginantia, intermedia usque 9 cm. longa et 2·5 cm. lata, sursum sensim decrescentia in bracteas abeuntia. *Racemus* 15–25 cm. longus, circiter 5 cm. diametro, subdense multiflorus ; bracteae lanceolatae, acuminatae, ovarium pedicellatum subaequantes vel paulo superantes, extra et praesertim marginibus glanduloso-pubescentes. *Flores* suberecti, verosimiliter virides ; ovarium pedicellatum 2·5–4 cm. longum. *Sepalum* intermedium ovatum, acutum, carinato-concavum, 5·5–7 mm. longum, 2·5–4 mm. latum, extra sparse pubescens, carina basi scabridula ; sepala lateralia semi-ovata vel semi-orbicularia, margine anteriore valde dilatata, oblique subacuta vel obtuse acuminata, 8–10 mm. longa, 5–6·5 mm. lata, extra sparse pubescentia. *Petala* bipartita ; partitio posterior lineari-ligulata, subacuta, 6–6·5 mm. longa, 0·7–1·5 mm. lata, papilloso-puberula ; partitio anterior multo major, subfalcatim lanceolato-cultriformis, obtusa, 10–11 mm. longa, basin versus 1·8–2·2 mm. lata, papilloso-puberula. *Labellum* ex ungue circiter 1 mm. longo tripartitum ; partitio intermedia linearis, obtusa, 10–12 mm. longa, 0·8–1·4 mm. lata, subcarnosa ; partitiones laterales anguste lineares, 5–6·5 mm. longae, 0·3–0·5 mm. latae ; calcar dependens, dimidio inferiore cylindricum, apice clavato-inflatum, obtusum, circiter 2·5 cm. longum. *Anthera* subdeclinata, 2·5–3 mm. alta, obtusa, canalibus apice leviter incurvatis 2·7–3 mm. longis, staminodiis bilobis. *Brachia* stigmatifera crassa, clavata, 3·5–5 mm. longa, antherae canales aequantia vel paulo excedentia. *Rostelli* lobus intermedius ligulatus, apice triangulari-acutus, 2·5–3·2 mm. longus, antheram bene superans ; lobi laterales ab intermedio angulo recto divergentes.

KENYA COLONY. Mt. Elgon, 6700 ft., Nov. 1931, *Tweedie* 25 (type). Nandi District, 6000 ft., Nov. 1898, *Whyte*.

UGANDA. Mt. Elgon, Butandiga, on rocky knoll, 7000 ft., in fruit, Jan. 1918, *Dummer* 3646. Ruwenzori, 7000 ft., *Dawe* 670a.

The four specimens cited above agree well with one another and show constant differences from *H. cultriformis* Kraenzl., which is their closest ally. It appears that the species is generally distributed on the mountains of western Kenya and Uganda at about 6–7000 ft. altitude.

Habenaria Kilimanjari *Rchb. f.* in Otia Bot. Hamburg. **2,** 119 (1881). *H. Uhligii* Kraenzl. in Engl. Jahrb. **43,** 396 (1909). *H. lutaria* Schltr. in Engl. Jahrb. **53,** 515 (1915). *H. Theodori* Kraenzl. in Vierteljahrsschr. Nat. Ges. Zürich, **74,** 107 (1929).

There is no doubt that the above four " species " are really one and the same, as an examination of the type specimens shows. The remarkable feature of the species is the prolongation of each of the lateral lobes of the rostellum into a pincer-like process in which the much enlarged gland is held. Although the flower structure is remarkably constant in most details the posterior lobes of the petals show considerable variation, the posterior margin being angled or drawn out into a definite lateral tooth. Flowers on Uhlig No. 11 show this tooth well developed, but in the flowers of Uhlig No. 1 (the other syn-type specimen of *H. Uhligii* Kraenzl.) the tooth is only weakly developed while other specimens show every intermediate to the slightly angled petal-lobes of *H. Kilimanjari* type.

The distribution of the species according to the specimens I have seen is S. Kenya, Tanganyika, S.W. Belgian Congo and Nyasaland.

In *H. martialis* Rchb. f. we have a close ally of *H. Kilimanjari*, the flowers possessing the same pincer-like structure of the rostellum side-lobes while the general construction of the flowers agrees closely. The posterior petal-lobes are narrower and more acuminate while the flowers themselves are much smaller. I strongly suspect that this species really only represents a small form or individual of *H. Kilimanjari* but until more intermediate material is available it is advisable to maintain the two as distinct species.

Habenaria (§ Bilabrellae) angustissima *Summerhayes*, sp. nov.; *H. ichneumoneae* Lindl. similis, sed statura minore, inflorescentiis 3–5-floris, ovario pedicellato breviore, petali lobo posteriore quam anteriore duplo latiore, calcari satis breviore facile distinguenda.

Herba terrestris, gracilis, erecta, 15–30 cm. alta; tuber non visum. *Folia* 3–6, infimum ad vaginam redactum, intermedia linearia, acutissima, 4–10 cm. longa, usque 7 mm. lata, suprema in bracteas abeuntia. *Racemus* laxe 3–5-florus, 4–7 cm. longus; bracteae lanceolatae, aristato-acuminatae, usque 11 mm. longae. *Flores* suberecti vel erecto-patentes, ovario pedicellato 1–1·5 cm. longo. *Sepalum* intermedium elliptico-ovatum, subacutum, 5·5–5·8 mm. longum, 3–3·5 mm. latum; sepala lateralia oblique cuneato-obovata, lateraliter apiculata, 7–7·5 mm. longa, 3–3·5 mm.

lata. *Petala* bipartita; partitio posterior rhomboideo-elliptica, apice acuta, basi angustata, 5–5·5 mm. longa, 2·2–2·5 mm. lata, ciliolata; partitio anterior oblanceolato-ligulata, acuta, 6–6·5 mm. longa, 0·8–1 mm. lata, papillato-puberula. *Labellum* ex ungue 1–1·5 mm. longo tripartitum; partitiones anguste lineares, 0·4 mm. latae, intermedia 8–8·5 mm. longa, laterales 5·5 mm. longae; calcar rectum, cylindricum, apice paulo dilatatum, obtusum, 7–8 mm. longum. *Anthera* 3·5–4 mm. alta, apice obtuse apiculata, canalibus gracilibus leviter incurvatis apice cum rostelli lobis lateralibus leviter clavatis 5 mm. longis; staminodia biloba, 0·7 mm. longa. *Processus* stigmatiferi graciles, apice capitati, 5·5 mm. longi; rostelli lobus intermedius subulatus, subacutus, 2·4 mm. longus.

FRENCH GUINEA. Mamou, Aug. 1907, *Pobéguin* 1680 (type in Herb. Mus. Paris.).

A small, rather slender species, very reminiscent of *H. ichneumonea* Lindl. but differing in quite a number of minor features and possibly more nearly related to some other species of Sect. Bilabrellae. It shares with *H. ichneumonea* the extremely narrow leaves. Perhaps the most interesting feature is the broad posterior petal-lobe, which is much wider than the anterior lobe.

Platycoryne megalorrhyncha *Summerhayes*, sp. nov.; affinis *P. tenuicauli* Rolfe, a qua caule magis foliato, floribus minoribus, anthera obtusa nec longe apiculata canalibus brevioribus, brachiis stigmatiferis apice ovato-dilatatis antherae canales excedentibus, rostelli lobo intermedio antheram bene superante differt.

Herba terrestris, gracilis, omnino glabra, 20–30 cm. alta. *Caulis* foliatus, erectus, teres, basi cataphyllis paucis acutis vaginantibus instructus. *Folia* lanceolata vel lineari-lanceolata, acutissima, basi caulem amplectentia, usque 5 cm. longa et 9 mm. lata, superiora minora. *Racemus* 3–4 cm. longus, circiter 2 cm. diametro, dense 6–7-florus; bracteae lanceolatae, subaristato-acuminatae, ovario pedicellato saepius breviores, usque 2 cm. longae. *Flores* suberecti, ovario pedicellato circiter 1·7 cm. longo. *Sepalum* intermedium ovatum, acutum, carinato-concavum, 7 mm. longum, 4·5 mm. latum; sepala lateralia oblique oblongo-lanceolata, subacuta, 7·5 mm. longa, 2·5 mm. lata. *Petala* e basi latiore falcatim ligulata, acuta, 6·5 mm. longa, 1 mm. lata. *Labellum* simplex, anguste linguiforme, carnosum, marginibus recurvatis, 6·5 mm. longum, 1·3 mm. latum (explanatum); calcar dependens, cylindricum, dimidio superiore clavato-inflatum, obtusum, 14 mm. longum. *Anthera* erecta, obtusa, 3·5 mm. alta, canalibus porrectis crassiusculis 2·5 mm. longis. *Brachia* stigmatifera crassa, apice ovata dilatata, 2·5 mm. longa, antherae canales paulo excedentia. *Rostelli* lobus intermedius e basi latiore oblongo-lanceolatus, acutus, 2·4 mm. longus, 1·2 mm. latus; lobi laterales basi latissimi ab intermedio sinu lato rotundato sejuncti.

SOUTHERN NIGERIA. Bamenda District, Fougom, in boggy ground, 3500 ft., April 1931, *Maitland* 1509 (type).

The large rostellum is placed in front of and is quite distinct from the column which it overtops. The front lobe widens at the base and the margin curves downwards almost to the apex of the anther canals, it therefore being very difficult to delimit the front and side lobes. The stigmata are widened at the apex into flattened somewhat concave ovate receptive surfaces. *P. tenuicaulis* Rolfe has a similar type of rostellum but the middle lobe is smaller and the anther canals much longer ; the stigmata are also differently shaped and smaller.

ROEPEROCHARIS Rchb. f.

This genus, as originally proposed by Reichenbach, consisted of a number of Abyssinian species with a remarkably constructed column, the essential features of which were the division of the column into two almost separate portions, the placing of the two anther loculi at some distance from one another at the two ends, the absence of any middle lobe to the rostellum, and the division of each stigmatic process into two lobes, one prolonged downwards as in *Habenaria* and the other upwards in the opposite direction.

Since then a number of quite incongruous forms have been added to the genus so that it is virtually impossible to distinguish it from *Habenaria* by any adequate characters.

Kraenzlin first added *R. occidentalis* Kraenzl., a West African species. This plant has of the features given above only the separation of the anther loculi, a character which is also found in Sect. Multipartitae of *Habenaria*. The rostellum and stigmata are quite like those of *Habenaria* with the exception of a small apparent outgrowth on the upper side of the stigmata near the apex. This, however, is nothing like that in the other species of *Roeperocharis*.

Later on Kraenzlin, without having seen the species, transferred *Habenaria Rendlei* Rolfe to *Roeperocharis*, and later Schlechter transferred three other allied species, namely, *H. combusta* Ridl., *H. peristyloides* A. Rich. and *H. cardiochila* Kraenzl. He also described a further species of *Roeperocharis*, *R. ukingensis* Schltr., which was said to be closely allied to *R. Rendlei* Kraenzl.

I have examined three of these species and the structure of the column is, in my opinion, totally unlike that of the true species of *Roeperocharis*. The two anther loculi are quite adjacent, the column being undivided, the middle lobe of the rostellum is large and entire while the stigmatic processes are quite undivided. In general structure, indeed, the species all approach very closely to such species as *Habenaria Montolivoea* Kraenzl., *H. lefebureanus* Dur. et Schinz and a number of Indian species. Most of the above have been referred to the genus *Peristylus*, which, however, cannot be distinguished from *Habenaria*, and which is not closely related to *Roeperocharis*.

So far as I can see from my own dissections and from illustrations and descriptions the genus consists of the following six species, but it is possible that one or two of these may on examination prove to belong to *Habenaria* :—*R. Bennettiana* Rchb. f., *R. urbaniana* Kraenzl., *R. platyanthera*, Rchb. f., *R. alcicornis* Kraenzl., *R. elata* Schltr., and *R. Wentzeliana* Kraenzl.

Of the remaining six species formerly referred to the genus, *R. ukingensis* Schltr. is seen on examination to be the same as *H. Rendlei* Rolfe, while the others, with the exception of *R. occidentalis* Kraenzl., were originally described in *Habenaria*, viz. *H. Rendlei* Rolfe, *H. combusta* Ridl., *H. peristyloides* A. Rich. and *H. cardiochila* Kraenzl. and should be replaced in that genus.

With regard to *R. occidentalis* the case is as follows. In the *Kew Bulletin* for 1932, p. 191, I described a new species of *Habenaria*, namely, *H. obovata*, which I now find is conspecific with *Roeperocharis occidentalis* and which is really correctly placed in *Habenaria*.

I am also transferring *Amphorchis occidentalis* Lindl. to *Habenaria* under the name *H. occidentalis* (see p. 246). This combination cannot be used also when transferring *Roeperocharis occidentalis* and it is therefore necessary to adopt the name *Habenaria obovata* Summerhayes for the latter. The trivial " occidentalis " was used by Lindley for his *Amphorchis* long before Kraenzlin described his *Roeperocharis*. This arrangement avoids the necessity for creating a further new name.

Satyrium occultum *Rolfe* in Dyer, Fl. Trop. Afr, **7**, 273 (1898).
S. zombense Rolfe, l.c.

I can find no satisfactory specific differences on examining the two type specimens of these species and the other material which has been added since. The relative measurements of the length and breadth of the lip depend a great deal on the degree to which the apical recurved portion is developed ; this varies considerably even on flowers from the same individual. The degree to which the bracts project beyond the flowers is also a variable character. The rostellum, which is perhaps the most important diagnostic character in *Satyrium*, is identical in the two species. This is otherwise in *S. Nuttii* Rolfe, which is very similar to the above species in general facies, but in which the rostellum is markedly different, the middle lobe being deeply cleft. It is hardly correct to describe the rostellum as bilobed (as in the Flora of Tropical Africa), since that obscures the very definite relationship between *S. Nuttii* and *S. occultum*.

Disperis cordata *Summerhayes* sp. nov. ; affinis *D. togoensi* Schltr. a qua foliis et bracteis multo majoribus, labelli appendicibus longioribus a labello angulo acuto neque recto divergentibus differt.

Herba terrestris, parva, usque 7 cm. alta ; tuber elongato-ovoideum, 1–1·5 cm. longum, 5 mm. diametro. *Caulis* gracilis, teres, 2–3-phyllus. *Folia* alterna, sessilia, late ovata vel suborbicularia, obtusa, basi cordata, 6–10 mm. longa, 7–10 mm. lata, subcarnosa. *Flores* 5–6, in racemo brevi subcorymboso dispositi ; bracteae foliis similes, ovatae, usque 10 mm. longae et 8 mm. latae ; ovarium pedicellatum gracile, circiter 1 cm. longum. *Sepalum*

intermedium lineare, acutum, 8 mm. longum, 0·6 mm. latum; sepala lateralia oblique semiovata, apicibus divergentia acuta, quadrante basilari connata, 8·5 mm. longa, 4 mm. lata, infra medium margines interiores versus breviter saccata. *Petala* semi-ovata, acuta, margine posteriore recta, anteriore basi dilatata, 8 mm. longa, 2–2·2 mm. lata, sepalo intermedio agglutinata cucullum leviter concavum basi cordatum formantia. *Labellum* in toto 5 mm. longum, basi columnae per 2 mm. adnatum, superne lineare, apice in laminam orbicularem, 1·5 mm. longam, 2 mm. latam, media basi lamella erecta quadrata instructam dilatatum, ungue supra columnam appendicibus duabus anguste linguiformibus 1·5 mm. longis papillosis ab ungue angulo acuto divergentibus instructo. *Columna* 1·75 mm. longa. *Rostelli* lobus intermedius orbicularis; brachia lateralia 1·5 mm. longa.

S. Nigeria. Bamenda District, Bum, in grassland at edge of forest, 4000 ft., April 1931, *Maitland* 1519 (type).

In the structure of the flowers, especially the lip, the species is evidently an ally of *D. togoensis* Schltr. and *D. Johnstoni* Rchb. f. From the latter it is readily distinguished by the much dilated lower portion of the petals as a result of which the galea composed of the joined dorsal sepal and petals is cordate at the base instead of cuneate as in *D. Johnstoni*. *D. togoensis* Schlt. is a very slender plant with extremely small leaves and bracts whereas in *D. cordata* these are both well developed. There are also small differences in the lip structure.

Disperis Mildbraedii *Schltr.* in Wiss. Ergebn. Deutsch. Zentr.-Afr.-Exped. 1910–11, **2**, 180 (1922), nomen; affinis *D. nemorosae* Rendle et *D. kamerunensi* Schltr., a quibis petalis apice aristato-acuminatis, labelli limbo duplo breviore, appendice inferne erecta galeae apicem versus subito inflexa biloba lobis papillosis distinguenda.

Herba terrestris, erecta, gracilis, glabra, circiter 15 cm. alta. *Caulis* strictus vel leviter flexuosus, teres, basi cataphyllo vaginante acuto instructus, supra medium bifoliatus, apice 1–3-florus. *Folia* subopposita, inaequalia, breviter petiolata, ovata vel triangulari-ovata, breviter acuminata, usque 4 cm. longa et 3 cm. lata. *Bracteae* lanceolatae, acuminatae, usque 1·4 cm. longae et 6 mm. latae. *Flores* erecto-patentes, albi; ovarium pedicellatum 1–1·5 cm. longum. *Sepalum* intermedium lineare, acutum, supra medium subito inflexum, in toto 2·8 cm. longum, 1 mm. latum; sepala lateralia oblique obovata, rotundata, 11 mm. longa, 5·5 mm. lata, margines anteriores versus breviter acute saccata. *Petala* basi late rotundato-auriculata, apice aristato-acuminata, sepalo intermedio agglutinata galeam superne cylindricam, obtusam, inferne apertam, antice acute trilobam, 1·6 cm. longam formantia, petalorum acuminibus liberis 4 mm. longis. *Labellum* basi columnae per 4 mm. adnatum, supra columnam lineare, 6 mm. longum, apice obtuso gibbiformi 0·5 mm. longo terminatum, prope hunc apicem facie

superiore appendice erecta 7 mm. alta galeae apicem versus subito inflexa biloba lobis pendulis ligulatis subcarnosis papillosis 3·5 mm. longis instructum. *Columna* teres, 4 mm. longa; rostelli brachia gracilia, leviter flexuosa, 1·5 mm. longa.

FERNANDO PO. Peak of Sta Isabel, north side, above Basilé, in mountain forest, 3670–4670 ft., Aug. 1911, *Mildbraed* 6312 (type in Berlin Herb.).

An ally of *D. nemorosa* Rendle, *D. Anthoceros* Rchb. f. and *D. kamerunensis* Schltr. from each of which it differs in the detailed structure of the lip. Above the column this is erect and enclosed in the galea, but the lip proper terminates in a small papillose knob not far above the apex of the rostellum. The appendage continues the lip in an almost straight line into the galea being sharply incurved at the apex and then bilobed. The most striking feature about *D. Mildbraedii*, however, is the aristate acuminate ends to the petals, these projecting forwards from the front base of the galea like two horns.

Vanilla ramosa *Rolfe* in Journ Linn. Soc. Bot. **32,** 457 (1896).
V. ovalifolia Rolfe, l.c.

Examination of the type specimens shows that apart from flower size there are no essential differences between these two species. All the indications suggest that the type of *V. ovalifolia* possesses only incompletely developed flowers which are thus smaller than the fully opened ones in *V. ramosa*. I have, therefore, adopted the name *V. ramosa* for this species, although since the inflorescences are not always branched the name is not very suitable. It should be noticed that the crest on the lip is formed of the same number of scales (4–5) in each specimen. (Compare with descriptions in Flora of Tropical Africa **7,** 177–178.)

XXXIII—MISCELLANEOUS NOTES

New Shelter in Cambridge Cottage Garden.—Some months ago a representative of Messrs. English Brothers of Barnard's Wharf, Rotherhithe, one of the subsidiary interests of Messrs. Gabriel Wade and English, Timber Merchants, Aldwych House, called at Kew to discuss a project the firm had in view in connection with the importation of Western Red Cedar (*Thuja plicata*) from British Columbia for the erection of houses, summerhouses, etc., built entirely from this wood. In the course of conversation the possibility of exhibiting shingles or a model of a building in the Kew Museums was discussed, and finally an alternative offer was made by the firm to erect a shelter for the use of visitors to Kew. The offer was gratefully accepted and the building was erected in February of the present year.

The value of Western Red Cedar wood for building purposes, and particularly for the manufacture of shingles, has long been recognised in British Columbia, for the wood untreated by preservatives has a very long life when fully exposed to weather changes.

The resistance of the wood to decay is referred to by H. N. Whitford and R. D. Craig in " Forests of British Columbia," p. 197, in the following words :—" Old cedar windfalls, that fell centuries before Columbus discovered America, are still sound, except for the sapwood, though another generation of forests has grown to maturity on top of them. Though, on account of the thinness of the bark, it is very easily killed by fire, cedar sustains perhaps less damage, commercially, from fire than any other coast species. This is due to the fact that the wood in the fire-killed trees, whether standing or down, remains sound for many years."

The Kew shelter is built to a design supplied by Mr. J. H. Markham of His Majesty's Office of Works. It is octagonal in shape, boarded on five sides with sawn weather boards, and panelled internally with prettily grained boards which form a back for comfortable seating for ten persons. The roof is covered with hewn shingles and the whole building has a very pleasing effect in a setting of trees and herbaceous plants.

A further test of untreated wood of Western Red Cedar is being made in the Orchid Houses at Kew, where staging was constructed over a year ago in order to find out how it withstood the trying conditions of constant heat and moisture in comparison with wood of Scots Pine and Teak.

Florida Wild Life.*—This book consists of a series of essays written in popular style on the natural history of Florida. The greater part of the volume deals with plant life. One chapter is devoted to sea-shells and one to fishes, while several are concerned with questions of climate. The opening chapter entitled " A Tree that Walks " deals entirely with the " Mahoe " (*Hibiscus tiliaceus*) and some interesting observations on this well known tropical species are recorded, its method of rapid vegetative increase being illustrated by photographs. Miscellaneous plant communities and growth forms are then described. These include littoral plants, epiphytes, swamp-plants, vines and weeds.

In the discussion on weeds the author refers in indignant terms to the number of European species that are now troublesome on the American continent. He states, *inter alia*, that " Europe is the great weed factory of the world. She has not only filled the Orient with her vile tatterdemalion army but has plenty of representatives all through South and Middle America as well as the West Indies, while the whole of the United States and most of Canada are to-day overrun with her renegade plants." In more gleeful strain the author then draws consolation from the fact that species of *Agave* and *Opuntia* introduced from America as ornamental plants are now troublesome in parts of the Mediterranean region and remarks—" We don't like to be too far behind in the matter of exchanging

---

*By Charles T. Simpson. Macmillan & Co., Ltd., London, 1932, pp. xvi+199, illustrations 40. Price 12*s.* 6*d.* net.

plants." It is questionable whether the Old or the New World has the more cause for complaint from this "exchange." Many of the worst agricultural pests in the warmer regions of the Old World are of American origin, and one need but instance certain species of *Galinsoga*, *Tagetes*, *Ageratum*, *Bidens*, and *Alternanthera*.

Many statements throughout the book, particularly in the chapters on Epiphytes and Evolution of the Leaves, are open to question. In some instances the plants intended are loosely or wrongly named, which is regrettable, *e.g.*, the "Sea Bean" (*Entada scandens* Bth.) is referred to as *Mucuna*. However, as the book is written in a light and chatty style and with considerable humour, it is no doubt intended more for the general reader than for the serious student.
F. N. H.

Botanical Magazine.—Part 2 of vol. 156, which was published on April 1st, contains the following plant portraits:—*Meconopsis grandis* Prain (t. 9304), a native of the Sikkim Himalaya, and Tibet, E. of Mt. Everest; *Eriolobus trilobatus* Roemer (t. 9305), from the orient; *Cistus crispus* Linn. (t. 9306), a native of the W. Mediterranean basin; *Sigmatostalix radicans* Reichb. f. (t. 9307), from southern Brazil; *Euonymus nanus* M. Bieberstein (t. 9308), an interesting little bush spindle, native in S.E. Europe, Turkestan, N. China and Mongolia; *Acacia Baileyana* F. Mueller (t. 9309), the well-known, grey-leaved species of southern New South Wales; *Rhododendron Genestierianum* Forrest (t. 9310), found by the late George Forrest in N. W. Yunnan and Tibet; *Gentiana prolata* Balf. f. (t. 9311), a native of Sikkim and Bhutan; *Calceolaria picta* Philippi (t. 9312), restricted to the Coquimbo province, Chile; *Daphne aurantiaca* Diels (t. 9313), discovered by Forrest in the Lichiang range, N.W. Yunnan, and *Globba Winitii* C. H. Wright (t. 9314), from Siam.

Corrigenda.—In *K.B.* 1933, 143, line 5, "*Gnidia clutyoides*" should read "*Gnidia cluytioides*."

In *K.B.* 1933, 150, line 10, the phrase "comb. nov." should be omitted, the combination having already been made in *K.B.* 1932, 85.

Printed under the authority of HIS MAJESTY'S STATIONERY OFFICE
By the South Essex Recorders, Ltd., High Road, Ilford.

(263) Wt. 92/33 925 7/33 S.E.R. Ltd. Gp. 9.

BULLETIN OF MISCELLANEOUS
INFORMATION No. 6 1933
ROYAL BOTANIC GARDENS, KEW

XXXIV—THE VIABILITY OF SEEDS. J. H. TURNER.

The problem of seed viability has long proved of interest to botanists and those engaged in any form of agriculture.

Theophrastus (1) mentions that "Of seeds some have more vitality than others as to keeping; among the more vigorous ones are coriander, beet, leek, cress, mustard, rocket, savory . . ." and "in Cappadocia at a place called Petra they say that seed remains even for forty years fertile and fit for sowing."

Little was known about the vitality of seeds of wild plants until De Candolle, in 1832 (2), observed that "certain portions of soil, which, by reason of terracing work, were exposed to the air after several centuries, covered themselves the first year with a multitude of individuals belonging to certain species, sometimes uncommon in the vicinity." He concluded that the seeds of these species had remained viable for considerable periods in the soil.

Although much has been written regarding this subject since the time of De Candolle, the literature is very scattered and with few exceptions the accounts are based upon observations rather than experiments.

Duvel (3) has shown that the average life of seeds, as of plants, varies greatly with the different families, genera and species, but there is no relation between the longevity of plants and the viable period of the seeds they bear. Some seeds retain their power of germination for a few days only, such as the willows and poplars, others remain viable for months or even a considerable number of years. The life period of any species of seed, provided that it has been thoroughly matured, is largely dependent on environment. Climatic influences play an important part and loss of vitality is especially marked in the case of seeds stored in places of high temperature and humidity.

Only a limited number of cultivated plants produce seeds which retain their vitality for any length of time when buried in the soil, but the seeds of many plants known as "weeds" are capable of living in the soil for extended periods. Duvel (4) found that seeds of the cultivated sunflower, when buried for a year at three different depths, all decayed, whilst those of the wild sunflower retained their vitality and gave a germination of 66 per cent. at the maximum depth of 3 ft.

Many seeds are better preserved the deeper they are buried. At 3 ft. below the surface, the amount of moisture is always more uniform, the supply of oxygen is greatly lowered and the temperature is much reduced. The majority of seeds germinate best when subjected to daily alterations in temperature, and as these alterations do not take place at a depth of 3 ft. below the surface there is a better preservation of vitality as a result of the more dormant condition of the seed.

It is well known that on the soil of old pastures and woodlands freshly turned up, or on the mud of drained ponds, plants previously unknown in that locality appear. Some of these may have arisen from seeds recently transported, but others must have grown from seeds which have lain dormant in the soil for frequently a very lengthy period. A striking illustration of this was afforded during the War by the countless plants that appeared in devastated areas. The upheaval of the ground by continuous shelling brought innumerable dormant weed seeds to the surface, where they germinated and so completely covered the ground that all appeared to be a level plain.

Hill, in the Flora of the Somme Battlefield (5), says " In July poppies [*Papaver Rhoeas* L.] predominated, and the sheet of colour as far as the eye could see was superb ; a blaze of scarlet unbroken by tree or hedgerow. Here and there long stretches of chamomile (*Matricaria Chamomilla* L.) broke into the prevailing red and monopolised some acres ; and large patches of yellow charlock were also conspicuous, but in the general effect no other plants were noticeable, though a closer inspection revealed the presence of most of the common weeds of cultivation. . . . Charlock [*Sinapis arvensis* L.] not only occurred in broad patches but was also fairly uniformly distributed, though masked by the taller poppies. Numerous small patches were, however, conspicuous and these usually marked the more recently dug graves of men buried where they had fallen. . . . No doubt in the ordinary operations of ploughing and tilling of the ground in years before the war much seed was buried which has been brought to the surface by the shelling of the ground and subsequent weathering. In this connection the presence of charlock on the more recently dug graves, where the chalk now forms the actual surface, is of interest, since it adds further proof of the longevity of this seed when well buried in the soil." The appearance of charlock on earth thrown up by shells and in shell craters when there was no trace of it on the undisturbed ground, was remarked by other botanists during the War.

Farmers often object to deep ploughing, especially on light soils as it may " bring up the charlock," and many instances are known, such as that mentioned in the Gardener's Chronicle (6). A field had been seeded down to grass and kept as a hay field and pasture. Sixteen years after the elimination of the seed source, a heavily laden wagon was taken across this field after a hard frost and thaw ; the wheels sinking deeply tore up the ground, bringing much subsoil to the surface. In the following spring these furrows were filled with charlock, and when they flowered there were two parallel yellow ribbons marking the irregular course taken by the wagon. There was not another charlock to be seen in the field. After being under grass for 24 years, the field produced fumitory, poppies and charlock in abundance directly the surface was broken and the subsoil exposed to the atmosphere. Otherwise none of these weeds was ever seen.

Barrington (7), relates " For 60 or 70 years we have kept a book here which shows how each field has been annually cropped. . . . It occasionally happens, however, that we break old lea for a corn crop. For example, ' Wall's field ' was laid down in grass in 1869 and so remained until 1893. I well remember how surprised we were that year to see *Sinapis arvensis* . . . dotting the field of oats with yellow patches here and there."

Experiments made by Peter (8) at Göttingen show that seeds of charlock can retain their vitality in the soil for forty years, whilst Dorph-Petersen (9) found that although the germination of stored seeds of charlock after ten years was only 24 per cent., those which he had buried for the same period gave a germination of 87 per cent.

Professor E. J. Salisbury in a letter to the " Times " dated August 1st, 1932, relates that during the building of his house on former arable land, corn field weeds appeared and notably plants of the blue pimpernel (*Anagallis foemina* Mill.) a plant now exceedingly rare in that locality. These only appeared where the turf was stripped. The ground had been under hay for at least 60 years and there is little doubt that it was one of the many arable fields laid down to grass at the end of the Napoleonic wars.

Pugsley (10) mentions that *Fumaria officinalis* appeared on a heap of earth dug from the foundations of a house. The site was formerly arable land and it would seem that the seeds had lain buried ever since the field had been converted into pasture. No other flowering plant occurred on the heap.

Holmes (11) describes how a house that had been standing for about a hundred years was pulled down and the ground left vacant for a time. The following year henbane, *Hyoscyamus niger*, grew luxuriantly amongst the soil that had been exposed by clearing the foundations. " Such cases of retained vitality for a hundred years are rarely brought under notice."

There are many instances of the longevity of buried leguminous seeds. Trochu, quoted by Becquerel (12), cites that of *Ulex europaeus* which came up when trenches were dug in land which had been cleared of this plant and cultivated for 25 years. New trees were planted 15 years later, and the gorse reappeared, *i.e.*, after the seeds had been buried for 40 years.

Parkin (13) describes a similar occurrence. Gorse and heather-covered land was cleaned, drained and laid down to grass. Twenty-five years later, on ploughing the field, fresh seeds of gorse were brought to the surface and these germinated most abundantly where originally the gorse grew strongest.

Shenstone (14) mentions an interesting case of a garden in which a bush of *Ulex europaeus* had previously grown. The gorse had been removed for about 20 years, yet every year, on stirring the soil, new seedlings appeared.

Pugsley (10) describes the appearance of *Cytisus scoparius* on the bare slopes of a road cut through the grassy park-like land of Wimbledon estate. When the road was made the broom only occurred sparingly in the remoter parts of the common and there was none near the slopes. It seems probable that nearly a century ago, before the land was enclosed, the broom extended over the area now occupied by the road, and that the young plants may have originated from seed that had remained dormant for a century.

Johnson and Sowerby (15) state that plants of *Trifolium repens* often appear abundantly on land freshly brought under cultivation and that in the Fen districts white clover comes up so quickly after the land has been drained and ploughed that the inhabitants can scarcely be convinced that it is not a spontaneous product of the soil.

Ewart (16) found hard seeds of *Acacia* spp. buried deeply in the soil of Eucalyptus forests where there were no other Acacias within a mile ; he also found under trees of *Acacia dealbata*, seeds buried as deeply as 18 inches below the surface of the ground, which gave perfect germination.

C. W. James, in a letter to the " Times " of August 22nd, 1932, says " A rare example of the sudden rush to life of long-buried seeds occurred at Westonbirt a few years before Sir George Holford's death. In the winter he cleared away a quantity of *Rhododendron ponticum* in one of his woods. Next June the ground was literally blue with innumerable blossoms of the scarce *Campanula patula* of which the only specimen previously known at Westonbirt was at the edge of a wood nearly a mile away. Dr. Druce came from Oxford to see the sight and said ' I cannot believe my eyes.' The succeeding year very little of the plant was to be seen, though it had not entirely disappeared."

According to Shenstone (14) " Mr. A. B. Jackson states that when trees are grubbed up at Dawyck, Peebles, for replanting, the Foxglove springs up. It is well known that a single plant of Foxglove produces many thousands of seeds. Groups of these plants, which have probably at some time existed in the park, could easily have impregnated the soil with an abundant supply of their seeds, and subsequent groups have, no doubt, renewed the supply of seeds from time to time ; but one can scarcely resist the conclusion that the seeds must have retained their vitality for several years."

Pratt (18) records that on the Malvern hills when the soil was turned up, foxgloves sprang up plentifully. On one part which was made into a pathway, the young plants were soon crushed, but they grew up in rows on each side of the path as if they had been planted there.

O'Brien (18) cut a new walk through land that had been under grass for certainly not less than forty years. The following year mullein (*Verbascum*) came up in quantity in the disturbed soil. " It is not land where Mullein would grow wild, but the plant is used in this country (Ireland) as a remedy in consumptive cases, and it may have been cultivated long ago in some garden on this spot."

Comber (19) says " In 1897, a quantity of the large biennial *Onopordon* (Cotton Thistle) was grown in the wild garden here (at Nymans, Sussex) ; later the plants were cut down and carted to the rot-heap. This thistle has never been allowed to seed in the locality since. The decayed refuse was dug into a portion of the kitchen garden, and for twenty-five years this plant has periodically made its appearance, the seedlings being regularly destroyed with the hoe. The last plants germinated in 1927."

Peter (20) experimented with seeds from soil samples taken from forests that had been growing for known periods on formerly cultivated land. From these samples he secured the germination of numerous farm weeds, some of which, he estimated, grew from seeds that had been lying in the soil for 100 years. It is evident that weed seed can remain dormant in the soil for more than half a century. Brenchley (21) found that when grassland which had replaced arable was turned up, typical arable weeds appeared from seeds which had lain dormant in the soil for periods up to 58 years.

Probably the record longevity for any seed is that recorded by Ohga (22) who obtained approximately 100 per cent. germination with " seeds " of *Nelumbo nucifera* Gaertn. which he found on a peat bed buried two feet deep with loess in the Pulantien river valley in Southern Manchuria, the bed being 12½ metres above the present water level of the river. Judging by the age of trees of *Salix babylonica* on the bed of this former lake and from the rate of lowering of the water level, it is probable that the " seeds " are at least 120 years old and may be 400 years old or even older judging by the rate of erosion. In 1926 Ohga gave 30 of the "seeds" to the British Museum so that their viability might be tested at intervals. In 1931, Sir Arthur Hill suggested that it might be possible to grow seedlings of the *Nelumbo* at Kew and in April of that year the British Museum authorities sent two " seeds " from the Manchurian peat which they had induced to germinate. The pericarp is removed by soaking the "seed" in concentrated sulphuric acid for either 5 or 17 hours and then, after washing and keeping for a short time in water, the coat is taken off and the " seed " is kept at a temperature of 30°C. According to Ohga " In an ordinary case, when thus treated the sprout comes out after two days." The seedlings were potted and planted in the Victoria Regia pool, where they grew vigorously. The plants flowered during August 1932 and apart from the smaller flowers and seed vessels, there was nothing to distinguish them from *Nelumbo nucifera* Gaertn. raised from recent " seed." The embryo of *Nelumbo nucifera* is kept in an ideal state of quiescence by the hard pericarp and it is this impermeability of the " seed " which no doubt is the chief factor for its prolonged vitality. Peat appears to be an ideal medium for seed preservation and its antiseptic properties prevent deterioration through fungal attack.

When the longevity of buried seeds is estimated entirely from the circumstances in which they are found, there is the possibility of error, and the only satisfactory methods of ascertaining the length of time that buried seeds will remain viable are by experiments such as those begun by Beal and Duvel in the United States.

In the autumn of 1879 Beal (23) placed twenty samples of fresh seeds of twenty-one different kinds of plants mixed with moist sand in uncorked bottles. These were inverted and buried in a row about 4 inches apart and 20 inches below the surface of the ground. At intervals of five years, from 1879–1920, one of these bottles was removed from the row and the seeds tested for germination. In 1920 the interval of testing was extended to ten years, in order that the experiment might be continued over a further sixty years. Results (24) show that after being buried for fifty years, seeds of *Brassica*, *Oenothera*, *Polygonum*, *Rumex* and *Verbascum* still germinate.

In 1902, Duvel (4) started an experiment under more natural conditions. Thirty-two sets of 112 samples of seeds mixed with heavy clay soil were placed in earthenware pots and covered with porous saucers. These were buried in sets at depths varying from 6 to 42 inches below the surface of the soil. A report of tests (25) made up to the year 1923 showed that of the 107 species, 51 grew and gave a good percentage of germination after being buried for twenty years. On the whole the most deeply buried seeds retained their vitality the longest.

Not only seeds buried in the earth but those submerged in mud and water have the power of resting until conditions favour germination. Salisbury (26) in a paper entitled " Vegetation of Drying Mud and Retarded Germination " states that " retarded germination is apparently dependent on the continued immersion of the seeds, whilst germination rapidly ensues after a period of desiccation. . . . Only in exceptionally dry years, or when there is a prolonged and uninterrupted exposure of mud, are the seeds sufficiently desiccated to bring about germination." He describes various instances of the appearance of aquatic colonies in dried up ponds, which, previous to the exposure of the mud were at the most of very sparse occurrence.

Guppy (27) showed that the germination of some aquatic seeds can be delayed four or five years without impairing their vitality, whilst Shull (28) proved by experiments that the seeds of many land and water plants will germinate after being kept in mud and water for periods of four to seven years.

It is evident (29) that seeds washed down from the higher reaches of a river will germinate after a prolonged submersion in salt water, and that some seeds will withstand the action of salt water for considerable periods. Hemsley (30) relates that Guppy sent a germinating seed of *Thespesia populnea* to Kew. "This was collected fresh in the Keeling Islands in October, 1888, and kept dry until June 8th, 1890, when it was placed in sea water, where it remained floating until June 8th, 1891. It was then subjected to conditions favourable to germination, and in less than a fortnight it began to sprout and is now growing at Kew."

There are numerous instances of the germination of stored seeds. C. De Candolle (31) says "In 1850 Robert Brown, out of curiosity sowed some seeds from the collection of Sir Hans Sloane (in the British Museum), of which they had formed a part for more than a hundred and fifty years. He succeeded in making several of them germinate, particularly a seed of *Nelumbium speciosum*."

Specimens preserved in the British Museum show that Brown carried out four separate experiments with *Nelumbium* (*Nelumbo*) and that 85 per cent. of the *Nelumbium* fruits had retained their power of germination for about 150 years.

In the Journal of Botany, June 1926, Ohga described an attempt to germinate further fruits of *Nelumbium* from the Sloane Collection, but the tests were unsuccessful, and, with one exception, traces of mould were found in all the fruits examined.

"The germination of the seeds of *Nelumbium* by Robert Brown has hitherto constituted the record period of the viability not only for *Nelumbium*, but for any fruit or seed. My fruits dug out of the peat [i.e. in Southern Manchuria] are probably some centuries old, but the exact age cannot be determined until the age of the peat has been settled."

Becquerel (12) tested the germination of seeds of known age from 25 to 135 years, preserved in the Herbarium of the Natural History Museum of Paris. He found seven species, four *Leguminosae* and one each of *Malvaceae*, *Labiatae* and *Nymphaeaceae*, which retained their power of germination after 50 years. The oldest seeds found viable were :—

Cassia bicapsularis	87	years
Cytisus biflorus	84	,,
Trifolium arvense	68	,,
Lens esculenta	65	,,
Stachys nepetifolia	77	,,
Lavateria Olbia	64	,,
Nelumbium luteum	56	,,

The writer experimented with seeds collected in the Isle of Wight in 1842 by Dr. Bromfield, and also with seeds sent to Kew in 1851 by Peter Lawson & Co. These are preserved in loosely corked bottles in the Museums. The following seeds of *Leguminosae* germinated after treatment with concentrated sulphuric acid for periods of 15 to 35 minutes, according to genera.

Anthyllis vulneraria	90 years	4 per cent.
Trifolium striatum	90 ,,	14·1 ,,
Trifolium pratense	81 ,,	2·6 ,,
Lotus uliginosus	81 ,,	9·6 ,,
Melilotus alba	81 ,,	163 seeds, 1 germinated
Cytisus scoparius	81 ,,	636 seeds, 4 germinated
[*]*Medicago orbicularis* at least	78 ,,	22 per cent.
also [†]*Ipomoea* sp.	43 ,,	6 ,,

The seedlings are now growing in one of the houses at Kew. Seeds of *Polygonaceae, Cruciferae, Papaveraceae* and *Scrophulariaceae* failed to germinate.

Ewart (17) experimented with over 600 different kinds of seeds originally sent in 1856 from Kew to Melbourne for the projected Botanic garden. The seeds were put aside in a dry cupboard and remained unopened until 1906. His experiments confirmed those of Becquerel, the *Leguminosae* providing more than half the number of cases of longevity. He also tested other seeds stored for periods varying up to 105 years, and was successful in germinating two out of 26 seeds of *Goodia lotifolia* and two out of 12 seeds of *Hovea heterophylla*, both 105 years old.

Ewart divided all seeds into three biological classes according to their life duration under optimal conditions. *Microbiotic*, seeds whose duration of life does not exceed 3 years ; *Mesobiotic*, which may remain viable from 3–15 years and *Macrobiotic*, seeds which may remain viable from 15 to over 100 years. This last class is " characterised by cuticularised or more or less impermeable seed coats " and " is restricted to a few natural orders, of which *Leguminosae* greatly surpass all others, while *Malvaceae* and *Myrtaceae* come next in importance." Ewart enumerated the macrobiotic families as :—*Leguminosae, Malvaceae, Myrtaceae, Nymphaeaceae, Labiatae, Iridaceae, Euphorbiaceae, Polygonaceae, Geraniaceae, Sterculiaceae, Goodeniaceae,* and *Tiliaceae.*

As a result of Beal's and Duvel's experiments the following families may be added to the list :—*Compositae, Amaranthaceae, Gramineae, Cyperaceae, Urticaceae, Caryophyllaceae, Chenopodiaceae, Phytolaccaceae, Portulacaceae, Cruciferae, Rosaceae, Onagraceae, Umbelliferae, Convolvulaceae, Verbenaceae, Solanaceae, Scrophulariaceae* and *Plantaginaceae.*

Reviewing all the available data, he formed the opinion that " However dry the seeds may be they cannot indefinitely prolong their vitality. Even the most resistant seeds after 50 to 100 years show a pronounced decrease in the percentage germination, and the general trend of the curves is such as to show that the probable extreme duration of vitality for any known seed may be set between 150 and 250 years (*Leguminosae*)."

---

[*] The seeds of *Medicago orbicularis* had previously formed part of a carpological collection given to George Bentham, who, on June 29th, 1854, presented them to the Museum of the Royal Botanic Gardens.

[†] The seeds of *Ipomoea* were sent to Kew in 1889 for identification and had been kept in a packet for 43 years.

Fivaz (32) says " It would seem that Ewart, in omitting records of seeds stored in mineral soil, humus or " duff " from due consideration overlooked what may constitute optimal conditions for the preservation of vitality in seeds of some species of plants."

Fivaz shows that the seeds of *Ribes rotundifolium* may lie dormant in the forest floor for protracted periods and germinate soon after the ground is disturbed through fires, by logging operations or by the roots of trees blown down by the wind.

Gérardin (33) says " il est reconnu que des *haricots*, par exemple, que l'on auroit conservés avec soin, peuvent lever au bout de soixante ans." In a footnote he adds " J'ai semé, au printemps 1809, quelques espèces de haricots étrangers pris dans l'herbier de Tournefort, qui sont en pleines fleurs aujourd'hui 12 juillet."* He also states that seeds of *Mimosa pudica* from hermetically sealed bottles will germinate after 100 years.

Herschel (34) writes that seeds of *Acacia lophantha* germinated after being stored for 68 years. " The seeds were part of a packet received by Sir John Herschel from the Cape of Good Hope in 1843 and preserved since his death in 1871, in his cabinet." Seven plants were reared in 1910 and 1911 and a flowering specimen was presented to Kew.

Buckland (35) grew geraniums (*Pelargonium*) from seeds which had been stored away in a drawer for nearly fifty years, and in a letter to Kew dated August 2nd, 1932, Mrs. A. E. Christy states that seeds of *Reseda odorata*, put away in an envelope for at least 45 years, germinated and produced good plants.

Some of the instances of supposed seed viability are unsupported by definite evidence, and the " classical case of seed longevity " described by Heldreich was evidently founded on taxonomic errors. Heldreich puts forward the suggestion that the sudden appearance of a supposed new species which he named *Glaucium Serpieri* (shown by Dr. Turrill in K.B. 1933, 174, to be *G. flavum* var *leiocarpum*) and of *Silene juvenalis* (=*S. subconica*) in the Laurion area was due to their seeds having remained dormant for 1500 to 2000 years in the soil under the heaps of old mining debris. When the heaps were removed for re-smelting the seeds were " erst jetzt wieder zu neuem Leben zu erwachen." In the Atti, Congr. Intern. Bot. Firenze, 1874, 137 (1876) the same suggestion is sustained in the words " il est très probable que ces plantes ont été cultivées jadis par les anciens, et que leurs graines sont restées enfouies pendant des siècles sous les scories." A taxonomic investigation made by Dr. Turrill has shown that *Silene juvenalis* is conspecific with *S. subconica*, a not uncommon species in the countries around the Aegean Sea. There is nothing in the taxonomy or distribution of *S. subconica* and *G. flavum* var. *leiocarpum* to make it improbable for them to occur naturally in the

---

*Becquerel (12) considers that Gérardin may have been the victim of a fraud, as kidney beans do not usually remain viable for long periods.

Laurion district, and in all probability both species were in the neighbourhood before the heaps of debris were removed and simply spread on the vacated and denuded ground in the absence of close competition. " The evidence is all against either *Glaucium* or *Silene* at Laurion being examples of long enduring seed dormancy." Turrill, op. cit. 44.

There is no authenticated evidence that wheat taken from undisturbed Egyptian tombs will germinate. An experiment was made at Kew some thirty years ago with grain from a model granary, found in a tomb of the 19th dynasty and brought to England by Sir E. A. Wallis Budge. Samples were tested under various conditions and the effect of coloured glass was tried in the effort to induce germination, but after three months the grain had turned to dust. Percival (36) states " I examined a number (of grains) found by Prof. Flinders Petrie in the Graeco Roman cemetery at Hawara (about first century B.C.) . . . " the embryo had become dark brown, its plumule greatly shrivelled and little of its structure was visible."

In grain from a tomb of the 18th dynasty, 1400 B.C. " all the parts were more brittle and the embryo more completely disorganised than in the grains from Hawara. It is scarcely necessary to observe that the embryos were dead. Prof. Petrie tested samples of grain of Graeco-Roman age which he found at Hawara immediately after exhumation. The grains were sown on the banks of a canal in varying degrees of moisture . . . but none germinated."

According to Gain (37), although Egyptian wheat and barley often have an exterior appearance of good preservation, the embryo has undergone a marked chemical change and is no longer viable. This change shows that the dormant life of the grain has been long extinct.

Sir E. A. Wallis Budge has accounted for the popular belief in the germination of grain from Egyptian tombs and explains that for hundreds of years the natives of Egypt have used the halls of tombs for the wheat and barley obtained from Syria. Ancient coffins have been packed in this Syrian wheat and sent to England, and such grains will, of course, grow. During the last 30 years the native dragoman and guides have found that tourists will buy " mummy wheat " and they keep supplies in the tombs, carefully hidden, which they dig up under the eyes of the astonished visitor and offer as " mummy wheat " or " mummy barley."

Cereals are ill adapted for a prolonged period of quiescence. Sifton (38) has shown that Canadian wheat may retain its vitality for 18 years, and that the longevity of oats is greater than that of wheat, possibly owing to the protection of the hulls. Nineteen-year-old kernels of oats gave a germination of 41 per cent.

Percival (36) records an exceptional case of wheat remaining viable for twenty-five years.

White (39) found that in Australia the germination of wheat is lost after 11–16 years and that of barley after 8–10.

Fanciful tales are current with regard to "miracle" or "mummy" wheat, *Triticum turgidum* var. *mirabile* Körn and "mummy peas," *Pisum sativum* var. *umbellatum* (Mill.) Ser.

Miracle wheat is the commonest branched form of *Triticum turgidum* met with in South Europe and the North African coast. It is usually cultivated as a curiosity. Fasciated forms of the pea, similar to the so-called mummy pea, are figured by Tabernaemontanus in his Herbal published in 1590, and Miller in his Gardeners' Dictionary, 8th edit. 1771, described the form under the name of *Pisum umbellatum*, rose or crown pea.

The misleading name mummy pea is equally applied to the non-fasciated form, sometimes grown in cottage gardens. It is popularly asserted that miracle wheat and mummy peas originate from Egyptian tombs and that such seeds germinate when sown, but in every instance the statements prove to be without foundation.

BIBLIOGRAPHY.

1. THEOPHRASTUS. *Enquiry into Plants*, trans. Hort, ii. 97 and 209 (1916).
2. DE CANDOLLE, A. P. *Physiologie Végétale*, ii. 620 (1832).
3. DUVEL, J. W. T. "The vitality and germination of seeds." *U. S. Dept. Agric. Bur. Plant Indus. Bull.* lviii (1904).
4. ——. "The vitality of buried seeds." *U. S. Dept. Agric. Bur. Plant Indus. Bull.* lxxxiii (1905).
5. HILL, A. W. "The Flora of the Somme Battlefield," *Kew Bull.* 1917, 297–300.
6. *Gard. Chron.* ser. 3, xv. 470 (1894).
7. BARRINGTON, R. M. *Irish Naturalist*, xiv. 69–70 (1905).
8. PETER in *Deutsche Landw. Presse*, July 24, 1909.
9. DORPH-PETERSEN, K. *Journ. Board Agric.* xviii. 599–600 (1911)
10. PUGSLEY, H. W. "The longevity of seeds." *Journ. Bot.* lxvi. 203–204 (1928).
11. HOLMES, E. M. *Pharm. Journ.* xvii. ser. 4, 693 (1903).
12. BECQUEREL, P. "Recherches sur la vie latente des graines." *Ann. Sci. Nat. Bot.* sér. 9, v. 193–311 (1907).
13. PARKIN, J. *Nature*, cii. 65 (1918).
14. SHENSTONE, J. C. "The vitality and distribution of seeds," *Journ. Bot.* lxi. 297–305 (1923).
15. JOHNSON, C. AND SOWERBY, J. E. *The Useful Plants of Great Britain*, 74.
16. EWART, A. J. "On the Longevity of Seeds." *Proc. Roy. Soc. Victoria*, xxi. 1–210 (1908).
17. PRATT, A. *Flowering Plants*, iv. 121 (1873).
18. O'BRIEN, R. D. *Irish Naturalist*, xiv. 41–42 (1905).
19. COMBER, J. *Gard. Chron.* ser. 3, lxxxix. 359 (1931).
20. PETER, A. "Culturversuche mit 'ruhenden' Samen." *Nachr. K. Gesell. Wiss., Göttingen*, 1893, 673–691 (1894).

21. Brenchley, W. E. "Buried Weed Seeds." *Journ. Agric. Science*, ix. 1–31 (1918).
22. Ohga, I. "On the Longevity of the fruits of *Nelumbo nucifera*." *Bot. Mag. Tokyo*, xxxvii, 87–95 (1923).
23. Beal, W. J. "The vitality of seeds." *Bot. Gaz.* xl. 140–143 (1905).
24. Darlington, H. T. "The 50-year period for Dr. Beal's seed viability experiment." *Amer. Journ. Bot.* xviii. 262–265 (1931).
25. Goss, W. L. "The vitality of buried seeds." *Journ. Agric. Research*, xxix. 349–362 (1924).
26. Salisbury, E. J. "Vegetation of drying mud and retarded germination." *Naturalist*, Oct. 1921, 329–332.
27. Guppy, H. B. "On the postponement of germination of the seeds of aquatic plants." *Proc. Roy. Phys. Soc. Edinburgh* xiii. 344–359 (1897).
28. Shull, G. H. "The Longevity of submerged seeds." *Plant World*, xvii. 329–337 (1914).
29. White, J. W. "On the Germination of Seeds after Prolonged Submersion in Salt Water." *Proc. Linn. Soc.* 1884–85, 108–110 (1886).
30. Hemsley, W. B. *Annals of Bot.* v. 406 (1891).
31. De Candolle, C. "The Latent Vitality of Seeds." *Pop. Sci. Monthly*, li. 106–111 (1887).
32. Fivaz, A. E. "Longevity and germination of seeds of *Ribes*, particularly *R. rotundifolium*, under laboratory and natural conditions." *U. S. Dept. Agric. Techn. Bull.* 261 (1931).
33. Gérardin, S. *Essai de Physiologie Végétale*, i. 376, Paris (1810).
34. Herschel, W. *Kew Bull.* 1912, 110.
35. Buckland, R. M. H. *Gard. Chron.* ser. 3, lxxix. 444 (1926).
36. Percival, J. *The Wheat Plant, a Monograph* (1921).
37. Gain, E. "Sur les embryons du blé et de l'orge pharaoniques." *Comptes Rendus Acad. Sci. Paris*, cxxx. 1643–6 (1900).
38. Sifton, H. B. "Longevity of the seeds of cereals, clovers, and timothy." *Amer. Journ. Bot.* vii. 243–251 (1920).
39. White, J. "The Ferments and Latent Life of Resting Seeds." *Proc. Roy. Soc.* lxxxi. 417–442 (1909).

ADDITIONAL NOTE.

An analysis of the taxonomic distribution of the 30 families listed by Mr. Turner as including species with macrobiotic seeds shows that they belong to only 15 orders. Five families of Centrospermae are represented and three of Malvales, so that over 26 per cent. of the families are grouped in two orders. This suggests that one of the characters which make macrobiotism possible—an impermeable testa or pericarp—possesses considerable taxonomic significance. The systematic list is arranged according to Engler—Gilg, Syllabus der Pflanzenfamilien ed. 9 & 10, in order to show the connection between the families of Centrospermae.

GLUMIFLORAE : Gramineae, Cyperaceae.
LILIIFLORAE : Iridaceae.
URTICALES : Urticaceae.
POLYGONALES : Polygonaceae.
CENTROSPERMAE : Chenopodiaceae, Amaranthaceae, Phytolaccaceae, Portulacaceae, Caryophyllaceae.
RANALES : Nymphaeaceae.
RHOEADALES : Cruciferae.
ROSALES, suborder ROSINEAE : Rosaceae, Leguminosae.
GERANIALES : Geraniaceae, Euphorbiaceae.
MALVALES : Tiliaceae, Malvaceae, Sterculiaceae.
MYRTIFLORAE : Myrtaceae, Onagraceae.
UMBELLIFLORAE : Umbelliferae.
TUBIFLORAE : Convolvulaceae, Verbenaceae, Labiatae, Solanaceae, Scrophulariaceae.
PLANTAGINALES : Plantaginaceae.
CAMPANULATAE : Goodeniaceae, Compositae.

The possession of macrobiotic seeds must be of great importance in desert areas where rain falls at intervals of several or many years. An analysis of the 414 species of Angiospermae enumerated for the desert of Atacama by Philippi (Fl. Atacam. 7–56: 1860) shows that 268 of them (approximately 65 per cent.) belong to 25 of the 30 macrobiotic families listed by Mr. Turner, the 5 other families being unrepsented. Similarly, the flora of small sandy maritime islands which has presumably been recruited largely by means of water-borne seeds and fruits should include a high proportion of those possessing an impermeable testa or pericarp, and therefore mostly belonging to the 30 families concerned. An analysis of the 84 species listed by Millspaugh (Publ. Field Columb. Mus., Bot. ii. No. 5 : 1907) for the Florida Sand Keys, shows that 58 (69 per cent.) belong to 19 of the macrobiotic families, the 11 other families being unrepresented.

The fact that macrobiotic seeds occur in five of the nine families of Centrospermae suggests that they may also be found in some of the remaining four, namely Nyctaginaceae, Cynocrambaceae, Ficoidaceae (Aizoaceae) and Basellaceae. T. A. S.

XXXV—NOTES ON AFRICAN GRASSES : XIII.*

O. STAPF & C. E. HUBBARD.

Beckeropsis Pirottae (*Chiov.*) *Stapf et C. E. Hubbard*, comb. nov. *Pennisetum Pirottae* Chiov. in Ann Istit. Bot. Roma, **8**, 37, t. 2 (1903).

Distrib. Sudan and Eritrea.

Allied to *B. uniseta* (Nees) K. Schum., but with numerous (up to 12) racemes from the upper nodes, appressed slightly larger and looser spikelets and more slender culms.

Beckeropsis uniseta (*Nees*) *K. Schum.* in Engl. Pflanzenw. Ost-Afr. B. 52 (1895), in obs. *Gymnothrix uniseta* Nees, Fl. Afr. Austr. 66

---

*Continued from *K.B.* 1932, 152.

(1841). *Pennisetum unisetum* Benth. in Journ. Linn. Soc., Bot. **19,** 47, 49 (1881).
Distrib. Throughout tropical Africa and in Natal.

Pennisetum stenorrhachis *Stapf et C. E. Hubbard,* nom. nov. *P. tenue* Mez in Notizbl. Bot. Gart. Berlin, **7,** 53 (1917), non Fig. et De Not. (1854).
Distrib. Sudan.

Pennisetum fallax (*Fig. et De Not.*) *Stapf et C. E. Hubbard,* comb. nov. *Penicillaria fallax* Fig. et De Not. in Mem. Accad. Sci. Torino, Ser. 2, **14,** 371, fig. 29 (1854). *Pennisetum spicatum* var. *fallax* Durand & Schinz, Consp. Fl. Afr. **5,** 785 (1894). *P. americanum* forma *fallax* Leeke in Zeitschr. Naturwiss. **79,** 56 (1907). *P. spicatum* var. *vulpinum* b *fallax* Chiov. in Ann. Istit. Bot. Roma, **8,** 313 (1908).
Distrib. Sudan and Eritrea.

Pennisetum stenostachyum (*Klotzsch*) *Stapf et C. E. Hubbard,* comb. nov. *Penicillaria stenostachya* Klotzsch ex A. Br. in Ind. Sem. Hort. Berol. 1855, App. 25. *Pennisetum nigricans* var. *stenostachys* Durand & Schinz, Consp. Fl. Afr. **5,** 781 (1894). *P. americanum* forma *stenostachys* Leeke in Zeitschr. Naturwiss. **79,** 59 (1907).
Distrib. Senegal.

Pennisetum vulpinum (*A. Br.*) *Stapf et C. E. Hubbard,* comb. nov. *Penicillaria vulpina* A. Br. in Ind. Sem. Hort. Berol. 1855, App. 24. *P. spicatum* var. *vulpinum* Durand & Schinz, Consp. Fl. Afr. **5,** 786 (1894). *P. americanum* forma *vulpina* Leeke in Zeitschr. Naturwiss. **79,** 51 (1907).
Distrib. Sudan. Cultivated.

Pennisetum Sieberianum (*Schlechtd.*) *Stapf et C. E. Hubbard,* comb. nov. *Penicillaria Sieberiana* Schlechtd. in Linnaea, **25,** 565 (1852). *P. spicatum* var. *depauperatum* Aschers. et Schweinf. Illustr. Fl. Egypte, 162 (1887). *P. americanum* forma *Sieberiana* Leeke in Zeitschr. Naturwiss. **79,** 67 (1907).
Distrib. Egypt and Sudan. Cultivated.

Pennisetum pycnostachyum (*Steud.*) *Stapf et C. E. Hubbard,* comb. nov. *Cenchrus pycnostachyus* Steud. Syn. Pl. Glum. **1,** 109 (1854).
Distrib. Senegal, Gambia and Sierra Leone. Cultivated.

Pennisetum echinurus (*K. Schum.*) *Stapf et C. E. Hubbard,* sp. nov. *P. spicatum* subsp. *Willdenowii* var. *echinurus* K. Schum. in Engl. Pflanzenw. Ost-Afr. B. 55, 56 (1895). *P. typhoideum* var. *echinurum* Rendle in Cat. Afr. Pl. Welw. **2,** 191 (1899). *P. americanum* forma *echinurus* Leeke in Zeitschr. Naturwiss. **79,** 63 (1907).
Distrib. Uganda, Zanzibar, Tanganyika Territory, Nyasaland, Angola and South West Africa. Cultivated.

Pennisetum typhoides (*Burm.*) *Stapf et C. E. Hubbard*, comb. nov. *Alopecurus typhoides* Burm. Fl. Ind. 27 (1768) ; Gmelin, Syst. Nat. **2,** 167 (1791). *Penicillaria typhoides* Schlechtd. in Linnaea, **25,** 559 (1852). *Pennisetum typhoideum* L. Rich. in Pers. Syn. **1,** 72 (1805), in part.

Distrib. Sudan, Uganda, Kenya Colony, Tanganyika Territory, Belgian Congo, Nyasaland, Rhodesia, Angola, South Africa, Libya, tropical Arabia and India. Cultivated.

The commonest pearl millet of tropical East and South Africa and India.

Pennisetum subangustum (*Schumacher*) *Stapf et C. E. Hubbard*, comb. nov. *P. gracile* Benth. in Hook. Niger Fl. 564 (1849). *Panicum subangustum* Schumacher, Beskr. Guin. Pl. 59 (1827).

Distrib. Senegal, French Guinea, Sierra Leone, Southern Nigeria, Northern Nigeria, Cameroons, Belgian Congo.

Anthephora gracilis *Stapf et C. E. Hubbard*, sp. nov. ; affinis *A. truncatae* Robyns, sed culmis erectis vel geniculato-ascendentibus, spiculis majoribus, gluma inferiore ovata vel ovato-oblonga vel oblonga, seta breviore differt.

Gramen annuum. *Culmi* erecti vel geniculato-ascendentes, 45–70 cm. alti, graciles, teretes, simplices vel plerumque ramosi, 3–5-nodes, spicam versus scaberuli, ceterum glabri laevesque. *Foliorum* vaginae internodiis breviores, tenues, tenuiter striatae, inferiores carinatae, pilosae vel pubescentes, superiores sparse hirsutae vel glabrae, asperulae ; ligulae truncatae, usque ad 4 mm. longae, scariosae, auriculis vaginae angustis erectis adnatae ; laminae lineares, tenuiter acutae, usque ad 15 cm. longae, 2–4 mm. latae, planae, virides, breviter pilosae vel fere glabrae, asperulae. *Inflorescentia* spiciformis, gracilis, stricta vel flexuosa, 4–10 cm. longa, 3 mm. diametro, pallide flavido-viridis vel atroviridi- vel purpureo-variegata ; rhachis gracilis, flexuosa, triquetra, angulis minute puberulis ; rami minutissimi, cupuliformes ; fasciculi 2–3 mm. lati, subsessiles, supra medium leviter constricti, plerumque 4-spiculati. *Spiculae* 5–6 mm. longae. *Gluma* inferior spiculae aequilonga, ovata, ovato-oblonga vel oblonga, raro lanceolato-oblonga, obtusa vel subacuta, apice leviter recurva, arista scaberula erecta vel leviter patente 1·5–4 mm. longa terminata, marginibus angustis chartaceis exceptis coriacea, minute puberula, obscure 7-10–nervis ; gluma superior setaceo-subulata, 4–5 mm. longa, 1-nervis, membranacea, ciliolata. *Anthoecium inferum* ad lemma redactum : lemma lanceolato- vel ovato-oblongum, subacutum, 4–5 mm. longum, membranaceum, 3-nerve, minute puberulum, pilis paucis supra medium in nervis lateralibus obsitum. *Anthoecium superum* ☿ vel ♂ : lemma anguste ovatum, acutum, 4–4·5 mm. longum, tenuiter chartaceum, 3-nerve, dense puberulum ; palea lemmati aequilonga ; antherae fere 2 mm. longae. *Caryopsis* oblonga, 2·5 mm. longa.

TANGANYIKA TERRITORY : Kondoa District ; Sambala, 1470 m., common in old cultivations, *Burtt* 2039 (type) ; Mpwapwa, Tabugwe Valley, 1140 m., in paths and glades in deciduous thicket, *Burtt* 3946.

A very distinct species, readily distinguished from the other annual African species by its awned lower glume. It is also allied to the perennial species, *A. Burttii* Stapf et C. E. Hubbard, but has shorter leaf-blades, a wider obtuse or subacute lower glume and fewer spikelets in a cluster. From the annual American species, *A. hermaphrodita* (L.) O. Kuntze, it may be separated by the narrower leaves, loose false-spikes and awned lower glume.

Beckeropsis procera *Stapf*, sp. nov. ; affinis *B. unisetae* (Nees) K. Schum., sed culmis tenuioribus, laminis angustioribus, spiculis majoribus differt.

Gramen perenne, 60–150 cm. altum, e rhizomate brevi praemorso ortum ; gemmae innovationum acutae, squamis firmis ovatis laevibus glabris praeditae. *Culmi* erecti, 1–3 mm. lati, e nodis superioribus ramosi vel inferne simplices, nodis ad 14, plus minusve teretes, laeves, glabri, pallidi, nonnunquam glauci, internodio longissimo usque ad 25 cm. longo. *Foliorum* vaginae validae, inferiores et mediae internodiis aequilongae vel breviores, arcte appressae, pallidae, glabrae laevesque, basales plerumque purpureo-suffusae ; ligulae breves, ciliatae ; laminae lineares, raro e basi angusta petiolata saepe longa lineari-lanceolatae, in apicem setaceum longe attenuatae, usque ad 45 cm. longae et ad 4–8 mm. latae, superiores multo angustiores et fere filiformes, tenues, pallide virides, marginibus tenuiter scaberulis et nonnunquam facie exceptis laeves, glabrae. *Racemi* solitarii vel pluri-fasciculati, usque ad 4·5 cm. longi, pedunculis longis filiformibus ; rhachis gracillima, leviter angulata et scaberula ; pedicelli usque ad 1·5 mm. longi ; seta basalis usque ad 2·5 cm. longa. *Spiculae* plerumque laxe vel laxissime imbricatae, oblongo-lanceolatae, acutae vel apiculato-acuminatae, 3–4 mm. longae, pallide virides vel glaucae, raro purpureo-suffusae ; callus minutissimus, obscure scaberulus. *Glumae* minutae, obtusae vel plus minusve truncatae, enerves, scaberulae ; inferior usque ad 0·4 mm. longa ; superior usque ad 0·6 mm. longa. *Anthoecium inferum* sterile : lemma scaberulum, membranaceum, tenuiter 5-nerve ; palea nulla. *Anthoecium superum* ⚥ : lemma ut in anthoecio infero, nisi acuminatum et inferne glabrum ; palea lemmati fere aequilonga, hyalina, anguste truncata, 2-nervis ; antherae 1·2 mm. longae.

UGANDA : Mt. Elgon, Simu Valley, in shallow soil overlying rocks, 1500 m., *Snowden* 1243 ; Karamoja, Moroto Mtn., *Liebenberg* 10 A ; between Kotido and Koputh, 1200 m., *Liebenberg* 43.

KENYA COLONY : Nakuru, *Hitchcock* 25117 (type), *Scott Elliot* 6831.

SOUTHERN RHODESIA : Salisbury, forest margin, 1140 m., *Eyles* 3423.

Vern. name :—*Nabijinerwa* (Lugishu, Uganda).

Pennisetum (§ *Gymnothrix*) **massaicum** *Stapf*, descr. emend.; affine *P. Meziano* Leeke, sed spica spuria longiore laxiore et rhachi angulata denudata fulcris involucrorum laxe obsita, spiculis longioribus differt.

Gramen perenne; rhizoma breve, cataphyllis late ovatis coriaceis glabris obtectum. *Culmi* erecti vel geniculato-ascendentes, usque ad 45 cm. (vel ultra) alti, graciles, compressi, inferne duri, nodis usque ad 8, e nodis inferioribus et mediis ramosi, spicam spuriam versus scaberuli, ceterum glabri laevesque. *Foliorum* vaginae internodiis plerumque breviores, compressae, carinatae, tenuiter striatae, marginibus ciliatae, nonnunquam pilis e tuberculis ortis sparse hirsutae, sed plerumque glabrae, superiores minute scaberulae, ceterum laeves; ligulae ad seriem ciliorum densorum redactae; laminae lineares, tenuiter acutae, usque ad 22 cm. longae, ad 2–4·5 mm. latae, planae vel conduplicatae, firmae, virides vel glaucae, glabrae, raro pilis paucis e tuberculis ortis laxe aspersae, scaberulae vel laeves. *Spica spuria* densa, cylindrica, pallida vel purpureo-tincta, 2·5–10 cm. longa, 4–10 mm. lata (setis exclusis); rhachis gracilis, angulata, scaberula, denudata fulcris minutis hispidulis involucrorum laxe obsita; involucra subsessilia, demum patentia; setae complures, gracillimae, ad basin liberae, flexuosae, scaberulae vel interiores basin versus sparse ciliatae, 2–8 ceteris validiores et usque ad 1 cm. longae, ceterae breviores. *Spiculae* solitariae, sessiles, lanceolatae vel anguste ovatae, acute acuminatae, 5–5·5 mm. longae, glabrae. *Glumae* tenuiter membranaceae; inferior ovata, acuta, 2·5–3 mm. longa, plerumque 1-nervis, raro 3-nervis, supra mediam minute asperula; superior elliptico-ovata vel late elliptica, acuta, nonnunquam mucronulata, 3·5–4 mm. longa, 5–6-nervis, nervis minute scaberulis. *Anthoecium inferum* ♂: lemma explanatum late elliptico-ovatum, acute acuminatum, spiculae aequilongum, tenuiter membranaceum, 5-nerve, sursum versus asperulum; palea lineari-lanceolata, obtusa, lemmati aequilonga, carinis scaberulis. *Anthoecium superum* ⚥: lemma ut in anthoecio infero, nisi ellipticum, mucronatum, firme membranaceum, marginibus hyalinis; palea lemmati fere aequilonga. *Lodiculae* nullae. *Antherae* 2–2·5 mm. longae, apicibus glabris. *Styli* liberi.

KENYA COLONY: Makindu, *Linton* 72 (type); Kiu, *Linton* 39; Northern Frontier, Isiolo, 1110 m., *Edwards* 1655, 1656.

TANGANYIKA TERRITORY: Sino, Rift Valley, 900 m., *Haarer* 14A.

The accession of material of this and allied species from East Africa has led to a revision of the specimens originally referred to *P. massaicum*. This has necessitated the present emendation of the description published in the *Kew Bulletin*, 1906, p. 82 and the exclusion of *Scott Elliot* 9292, *Kässner* 584 and *Johnson* from Baringo, which represent *P. Mezianum* Leeke. Linton's specimen no. 72 has at the same time been selected as the name-type.

Pennisetum (§ *Gymnothrix*) **Haareri** *Stapf et C. E. Hubbard*, sp. nov.; affine *P. giganteo* A. Rich., sed ligula ciliolata, setis minus inaequalibus, spiculis densioribus demum reflexis distinguendum.

Gramen perenne, laxe caespitosum. *Culmi* erecti, plus minusve 2 m. alti, validi, teretes, nodis usque ad 12, simplices vel e nodis superioribus ramosi, ad spicam spuriam et ad nodos scaberuli et saepe hirsuti, ceterum glabri laevesque. *Foliorum* vaginae internodiis longiores, teretes, tenuiter striatae, inferiores latae, apicem versus pilis brevibus e tuberculis ortis plus minusve hispidae vel glabrescentes, superiores ad margines ciliatae vel glabrae laevesque; ligulae ad seriem ciliorum minutorum redactae; laminae lineares, tenuiter acutae, usque ad 75 cm. longae et ad 10 mm. latae, planae, firmae, virides, post ligulam pilosae, alioqui glabrae vel supra pilis paucis instructae, scaberulae, costa media lata. *Spica spuria* densa, cylindrica, 28–32 cm. longa, 10–12 mm. lata (setis exclusis), pallide viridis et purpureo-suffusa; rhachis dense et minute pubescens, denudata fulcris minutis hispidulis involucrorum dense obsita; involucra sessilia, demum patentia vel deflexa; setae 15–50, gracillimae, ad basin liberae, scaberulae, inaequilongae, terminalis ceteris validior et usque ad 1·4 cm. longa, ceterae usque ad 8 mm. longae. *Spiculae* sessiles, solitariae, lanceolatae, acutae, 4–5 mm. longae, glabrae. *Gluma* inferior oblata vel ovata, obtusa vel acuta, 0·5–1 mm. longa, hyalina, enervis; superior ovata, acuta vel acuminata, nonnunquam mucronata, 1–3 mm. longa, tenuiter membranacea, 1–3-nervis. *Anthoecium inferum* sterile: lemma explanatum ovatum vel elliptico-ovatum, acutum, spiculae fere aequilongum, membranaceum, 5–7-nerve, supra medium minute asperulum; palea linearis, 2 mm. longa, vel nulla. *Anthoecium superum* ⚥: lemma explanatum ellipticum, acutum, spiculae aequilongum, membranaceum, 5-nerve, supra medium minute asperulum; palea lanceolata, lemmati fere aequilonga. *Lodiculae* minutae. *Antherae* 2–2·5 mm. longae, apicibus glabris. *Styli* connati vel ad medium liberi.

TANGANYIKA TERRITORY: Bukoba, 1170 m., *Haarer* 2506.

Pennisetum (§ *Gymnothrix*) **Gossweileri** *Stapf et C. E. Hubbard*, sp. nov.; affine *P. giganteo* A. Rich., sed culmis geniculatis, nodis superioribus barbatis, rhachi laxe pubescente, spiculis inferioribus fasciculatis differt.

Gramen perenne, caespitosum. *Culmi* geniculati, plus 1 m. alti, graciliusculi, compressi, 4- vel pluri-nodes, ramosi, spicam spuriam versus scaberuli, ad nodos superiores barbati, ceterum glabri laevesque. *Foliorum* vaginae internodiis breviores, laxae, laminam versus carinatae, marginibus prope os barbatum ciliatae, sparse hirsutae, demum glabrae laevesque; ligulae ad seriem ciliorum densorum redactae; laminae lineari-lanceolatae, basi abrupte contractae vel leviter angustatae, tenuiter acutae, usque ad 30 cm. longae et ad 12 mm. latae, planae, firmae, glabrae vel supra scaberulae et pilis paucis brevibus pilosae, subtus laeves, marginibus scabridis. *Spica spuria* cylindrica, basi leviter interrupta, ceterum densa, 18 cm.

longa, 11–12 mm. lata (setis exclusis), pallida ; rhachis laxe pubescens, tenuiter costata, denudata fulcris minutis involucrorum laxe obsita ; involucra sessilia, patentia ; setae usque ad 30, gracillimae, inaequales, scaberulae vel plerumque nonnullae interiores basin versus sparse ciliatae, terminalis ceteris validior et usque ad 16 mm. longa, ceterae usque ad 9 mm. longae. *Spiculae* solitariae vel inferiores 2–3-fasciculatae, subsessiles, lanceolatae vel lanceolato-oblongae, acutae, 4·5–5 mm. longae, glabrae. *Glumae* ovatae ; inferior obtusa vel acuta, 1–1·5 mm. longa, hyalina, enervis ; superior acuta, nonnunquam mucronata, 2·5–3 mm. longa, tenuiter membranacea, 1–3-nervis. *Anthoecium inferum* ♂ : lemma explanatum ovato-oblongum, obtusum, mucronulatum, spicula paullo brevius, membranaceum, 5–7-nerve, ad nervos apicem versus scaberulum ; palea lanceolata, lemmate paullo longior, carinis minute scaberulis. *Anthoecium superum* ⚥, lanceolatum, acutum : lemma explanatum ovato-oblongum, obtusum, mucronulatum, spiculae aequilongum, membranaceum, 5–7-nerve ; palea lanceolata. *Lodiculae* minutissimae. *Antherae* 2·5–3 mm. longae, apicibus glabris. *Styli* connati.

PORTUGUESE MAYOMBE : Chiluango, Mimheje River, common, *Gossweiler* 5896.

Pennisetum (§ *Gymnothrix*) **macropogon** *Stapf et C. E. Hubbard*, sp. nov. ; affine *P. natalensi* Stapf, sed laminis pone ligulam dense barbatis, spica spuria atropurpurea, gluma superiore majore 1–3-nervi mucronata differt.

Gramen perenne, rhizomate brevi valido ; innovationes extravaginales. *Culmi* erecti vel ascendentes, usque ad 1·2 m. alti, subvalidi, teretes, simplices vel superne ramosi, nodis usque ad 13, flavidi, purpurei vel virides, infra spicam spuriam tenuiter striati et asperuli, ceterum laeves glabrique. *Foliorum* vaginae internodiis longiores, teretes, striatae, glabrae laevesque, inferiores latae, laxae, superiores arcte appressae ; ligulae ad seriem ciliorum redactae ; laminae lineares, basi angustatae, tenuiter acutae, usque ad 25 cm. longae, 2·5–3 mm. latae, planae, firmae, subtus virides et laeves, supra glaucescentes, arcte nervosae et scaberulae, ligulam versus pilis longis sericeis dense barbatae, ceterum glabrae. *Spica spuria* densa, cylindrica, erecta, gracilis vel validiuscula, 7–22 cm. longa, 4–7 mm. lata (setis exclusis), atropurpurea ; rhachis striata, scaberula, denudata fulcris minutissimis involucrorum densiuscule obsita ; involucra subsessilia, patentia ; setae usque ad 36, scaberulae, inaequales, terminalis ceteris validior et usque ad 8 mm. longa, ceterae usque ad 5 mm. longae. *Spiculae* solitariae, sessiles, ovatae vel ovato-oblongae, 3–3·5 mm. longae, glabrae. *Gluma* inferior ovata, obtusa, usque ad 1 mm. longa, tenuiter membranacea, uninervis vel enervis ; gluma superior ovata vel ovato-oblonga, obtusa vel acuta, mucronata, 1·5–2·4 mm. longa, membranacea, 1–3-nervis. *Anthoecium inferum* ♂ : lemma explanatum late ovato- vel elliptico-oblongum, obtusum, breviter mucronatum, spiculae aequilongum, membranaceum, 5-nerve; palea elliptica, bifida, lemmati fere aequilonga, carinis tenuiter scaberulis. *Anthoecium superum* ⚥, anguste ovatum, acutum: lemma explanatum ellipticum, obtusum, mucronatum, spiculae aequilongum, firme membranaceum, 5-nerve; palea anguste ovata, truncata, lemmati aequilonga. *Lodiculae* minutae. *Antherae* 1·5–2 mm. longae, apicibus glabris. *Styli* connati.

SOUTHERN RHODESIA: Salisbury, Makabusi River, amongst rocks, 1440 m., *Eyles* 3083; on river bank, *Eyles* 4771 (type); Inyazura, sand veld, *Fitt* 150; Gazaland, Nyahodi River, 1200 m., *Swynnerton* 1664A.

Pennisetum (§ *Gymnothrix*) **glaucocladum** *Stapf et C. E. Hubbard*, sp. nov.; affine *P. macropogoni* Stapf et C. E. Hubbard, sed laminis foliorum ebarbatis, culmis glaucis et pruinosis, anthoecio infero sterili differt.

Gramen perenne; rhizomata valida, usque ad 60 cm. longa et 8 mm. lata, multinodia, glabra laeviaque; innovationes extravaginales. *Culmi* erecti, usque ad 2·3 m. alti, validi, usque ad 8 mm. lati, teretes, simplices, raro ramosi, nodis usque ad 10, infra spicam spuriam dense scaberuli vel hispiduli, ceterum glabri laevesque; internodia inferiora omnino pruinosa vel ut superiora tantum infra nodos pruinosa vel glaucescentia. *Foliorum* vaginae internodiis longiores, laxae, teretes, glabrae laevesque, superne striatae et saepe transverse nervosae, inferiores latae, pallidae vel subfuscae, superiores virides; ligulae ad seriem ciliorum densorum redactae; laminae lineares, acutae, usque ad 45 cm. longae et ad 7 mm. latae, planae vel convolutae, firmae, virides, pone ligulam pilosae, marginibus scaberulis, ceterum glabrae laevesque. *Spica spuria* densissima, cylindrica, 7·5–19 cm. longa, 6–8 mm. lata (setis exclusis), pallida vel purpurea; rhachis gracilis, hispidula, denudata fulcris minutis involucrorum dense obsita; involucra sessilia, patentia; setae 12–20, gracillimae, scaberulae, inaequales, terminalis ceteris paulo validior et usque ad 8 mm. longa, ceterae usque ad 5 mm. longae. *Spiculae* solitariae, sessiles, lanceolatae, ovatae vel oblongae, acutae, 3–3·5 mm. longae, glabrae. *Glumae* hyalinae; inferior oblata, truncata, 0·3–0·5 mm. longa, enervis; superior oblata vel late ovata, obtusa vel acuta et mucronulata, 0·3–1 mm. longa, enervis vel uninervis. *Anthoecium inferum* sterile: lemma explanatum late ovatum vel ovato-oblongum, acutum vel obtusum, mucronulatum, 2·5–3 mm. longum, 3–5-nerve, membranaceum, superne minute scaberulum; palea nulla. *Anthoecium superum* ⚥, lanceolatum vel oblongum, acutum: lemma explanatum late ovato- vel elliptico-oblongum, obtusum, mucronulatum, spiculae aequilongum, 5-nerve, superne minute scaberulum; palea lanceolata, lemmate paulo brevior. *Lodiculae* minutissimae. *Antherae* fere 2 mm. longae, apicibus glabris. *Styli* connati. *Caryopsis* late oblonga, dorso compressa, 1 mm. longa.

NORTHERN RHODESIA: Livingstone, *Rogers* 7080.

SOUTHERN RHODESIA : Salisbury, 1440 m., *Brain* 4175, *Fitt* 152 ; Hopley Farm, 1500 m., *Eyles* 1618 ; Hunyani River, lining river bank, 1410 m., *Eyles* 4903 (type) ; Norton, 1350 m., *Eyles* 3458 ; Umtali, 990 m., *Eyles* 3073 ; Marandellas, 1560 m., *Walters in S. Rhod. Govt. Herb.* 2240 ; Ruzawi, in vlei, 1590 m., *Eyles* 4021 ; Matabeleland, Matopo Hills, *Rogers* 7951.

Pennisetum (§ *Gymnothrix*) **Franchetianum** *Stapf et C. E. Hubbard*, sp. nov. ; affine *P. stenorrhachi* Stapf et C. E. Hubbard (*P. tenue* Mez, non Fig. et De Not.), sed culmis simplicibus paucinodibus laevibus, fulcris involucrorum ad cicatrices subpatelliformes redactis, seta terminali longiore, gluma superiore emucronata differt.

Gramen perenne (?) ; basis ignota. *Culmi* graciles, ultra 30 cm. alti, geniculati, teretes, simplices, paucinodes, glabri laevesque. *Foliorum* vaginae internodiis longiores, laxae, teretes, laeves, glabrae vel ore pilis paucis praeditae ; ligulae ad seriem ciliorum redactae, pilis minutissimis ; laminae lineares, tenuiter acutae, usque ad 22 cm. longae, 2·5–4·5 mm. latae, planae, firmae, laeves vel ad margines et supra apicem versus scaberulae, pone ligulam obscure pilosae, ceterum glabrae. *Spica spuria* densa, cylindrica, 9 cm. longa, 5–6 mm. lata (setis exclusis), purpureo-tincta ; rhachis gracilis, tenuiter sulcata et angulata, scaberula, denudata cicatricibus subpatelliformibus minutissimis involucrorum densiuscule obsita ; involucra sessilia, patentia ; setae c. 20, gracillimae, scaberulae, inaequales, terminalis usque ad 8–16 mm. longa et ceteris validior, ceterae usque ad 5 mm. longae. *Spiculae* solitariae, sessiles, oblongae vel lanceolato-oblongae, 3·6–4 mm. longae, glabrae. *Glumae* ovatae, acutae vel obtusae, tenuiter membranaceae ; inferior 0·5–0·6 mm. longa, enervis vel uninervis ; superior 2–2·4 mm. longa, 1–3-nervis. *Anthoecium inferum* sterile : lemma explanatum ovato-ellipticum, abrupte acutum vel obtusum, mucronatum, spiculae aequilongum vel plerumque paulo brevius, membranaceum, 5-nerve ; palea nulla vel minutissima. *Anthoecium superum* ☿ : lemma explanatum elliptico-ovatum, obtusum, mucronatum, spiculae aequilongum, membranaceum, 5-nerve ; palea lemmate brevior, lineari-lanceolata, minute truncata, carinis superne scaberulis. *Lodiculae* minutissimae. *Antherae* 2 mm. longae, apicibus glabris. *Styli* connati.

GABOON : without precise locality, *Leroy* (type in Herb. Mus. Paris).

P. exile Stapf et C. E. Hubbard, to which the above species is closely allied, may be distinguished by the many-noded culms, minute yet prominent puberulous-tipped stumps of the fallen involucres and the slightly smaller spikelets. *P. riparioides* Hochst., with which our new species was confused by Franchet (Contrib. Fl. Congo Franç. 52), has branched culms scaberulous below the looser panicle, minute projecting stumps of the fallen involucres and slightly larger spikelets.

Pennisetum (§ *Gymnothrix*) **exile** *Stapf et C. E. Hubbard*, sp. nov. ; affine *P. stenorrhachi* Stapf et C. E. Hubbard, sed setis paucis, gluma inferiore ovata acuta enervi, anthoecio infero sterili ad lemma redacto differt.

Gramen perenne, rhizomate gracili erecto nudo. *Culmi* erecti, circiter 60 cm. alti, graciles, teretes, paulo ramosi, nodis usque ad 8, glabri laevesque. *Foliorum* vaginae teretes, fere glabrae, laeves, inferiores internodiis longiores, superiores breviores ; ligulae ad seriem ciliorum redactae ; laminae lineares, acutae, usque ad 13 cm. longae et 4 mm. latae, convolutae, erectae, rigidiusculae, glabrae, supra asperulae, subtus laeves. *Spica spuria* cylindrica, sublaxa, erecta, 10 cm. longa, 5 mm. lata (setis exclusis), pallide viridis et purpureo-variegata ; rhachis tenuiter costata, scaberula, denudata fulcris minutis involucrorum laxe obsita ; involucra sessilia, paulo patentia ; setae circiter 15, gracillimae, flexuosae, scaberulae, inaequales, terminalis ceteris validior et usque ad 11 mm. longa, ceterae breviores. *Spiculae* solitariae, sessiles, lanceolatae, dorso acute acuminatae, plerumque hiantes, 3·5 mm. longae, glabrae. *Glumae* ovatae, tenuiter membranaceae ; inferior obtusa, circiter 0·6 mm. longa, enervis ; superior acuta, 1·2 mm. longa, enervis vel uninervis. *Anthoecium inferum* sterile, ad lemma redactum : lemma explanatum ovatum vel ovato-oblongum, acutum, spicula paulo brevius, membranaceum, 5-nerve ; palea nulla. *Anthoecium superum* ☿ : lemma ut in anthoecio infero, sed paulo latius et spiculae aequilongum ; palea anguste ovata, truncata, lemmate paulo brevior. *Lodiculae* minutae. *Styli* connati.

TANGANYIKA TERRITORY : Kyimbila District ; Musomboland, Bundali Mts., *Stolz* 1294.

Pennisetum (§ *Gymnothrix*) **Davyi** *Stapf et C. E. Hubbard*, sp. nov., affine *P. Quartiniano* A. Rich., sed spiculis majoribus, lemmate inferiore aristato-acuminato, seta terminali usque ad 2·8 cm. longa, culmis 2-nodibus differt.

Gramen perenne, e rhizomate brevi ortum. *Culmi* suberecti, usque ad 60 cm. longi, teretes, moderate graciles, simplices vel basi ramosi, 2-nodes, infra spicam spuriam leviter scaberuli, ceterum glabri laevesque. *Foliorum* vaginae internodiis plerumque breviores, laxiusculae, teretes, tenuiter striatae, glabrae laevesque ; ligulae ad seriem ciliorum redactae ; laminae lineares, in apicem obtusum attenuatae, usque ad 25 cm. longae, plerumque convolutae vel explanatae et usque ad 5 mm. latae, firmae, rigidiusculae, glabrae laevesque, supra albidae. *Spica spuria* cylindrica, densiuscula, plumosa, 10–12·5 cm. longa, 5 mm. lata (setis exclusis), purpurea ; rhachis gracilis, scaberula, denudata fulcris minutis scaberulis involucrorum sublaxe obsita ; involucra sessilia ; setae circiter 12, gracillimae, scaberulae, purpureae, inaequales, terminalis ceteris validior et usque ad 2·8 cm. longa, ceterae breviores usque ad 15 mm. longae. *Spiculae* solitariae, subsessiles, lanceolatae, acutae, 4–4·5 mm. longae, glabrae. *Glumae* hyalinae ; inferior oblata, truncata, c. 0·4 mm. longa, enervis ; superior late ovata, obtusa, 1 mm. longa, enervis vel uninervis. *Anthoecium inferum* sterile :

lemma explanatum ellipticum vel elliptico-ovatum, aristato-acuminatum, spiculae aequilongum, membranaceum, 5-nerve; palea nulla. *Anthoecium superum* ⚥, lanceolatum, tenuiter acutum: lemma explanatum elliptico- vel ovato-oblongum, acute acuminatum, spiculae aequilongum, firme membranaceum, 5-nerve; palea lanceolata, lemmati aequilonga. *Lodiculae* minutae. *Antherae* 2 mm. longae, apicibus glabris. *Styli* ad trientem connati.

NYASALAND: Mt. Mlanje, on rock face in stream bed, 1840 m., *Burtt Davy* 2028–29.

Pennisetum (§ *Gymnothrix*) **Dowsonii** *Stapf et C. E. Hubbard*, sp. nov.; affine *P. ripario* Hochst., sed anthoecio inferi sterili, lemmate inferiore breviore enervi vel 1–3-nervi, spica spuria densa latiore differt.

Gramen perenne. *Culmi* e basi prostrato ascendentes, e nodis inferioribus radicantes, usque ad 50 cm. alti, graciles vel validiusculi, carnosi, compressi, simplices vel ramosi, 4–7-nodes, infra paniculam scaberuli et pubescentes vel glabri laevesque. *Foliorum* vaginae internodiis plerumque breviores, latae, laxae, compressae, laeves, glabrae vel ore laxe barbatae; ligulae ad seriem ciliorum minutorum redactae; laminae lineares, apice subobtusae, usque ad 30 cm. longae et ad 8 mm. latae, planae vel complicatae vel apicem versus involutae, firmae, pone ligulam pilosae, ceterae glabrae, supra scaberulae, subtus laeves. *Spica spuria* erecta, densiuscula, cylindrica, 4·5–10 cm. longa, 8–12 mm. lata (setis exclusis), pallida vel purpurascens; rhachis angulata, scaberula, hispidula, denudata fulcris basibus minutis involucrorum dense vel laxe obsita; involucra erecta vel paulo patentia, pedunculis usque ad 0·5 mm. longis; setae 14–24, gracillimae, scaberulae, inaequales, una vel duae interiorum ceteris validiores et 8–11 mm. longae, ceterae breviores. *Spiculae* solitariae, subsessiles, lanceolatae, acutae, 6–8 mm. longae, glabrae. *Gluma* inferior nulla; gluma superior oblata vel oblongo-elliptica, obtusa, 1 mm. longa, hyalina, enervis, vel nulla. *Anthoecium inferum* sterile: lemma explanatum lanceolatum vel late ovatum vel ovato-ellipticum, acutum vel obtusum, 1·5–3·5 mm. longum, hyalinum vel tenuiter membranaceum, enerve vel 1–3-nerve; palea nulla. *Anthoecium superum* ⚥, lanceolatum, acutum: lemma explanatum ovatum vel oblongo-ovatum, acutum, spiculae aequilongum, membranaceum, 3–5-nerve, apicem versus asperulum; palea lanceolata, acuta, lemmati aequilonga. *Lodiculae* nullae. *Antherae* 2·5–3 mm. longae, apicibus glabris. *Styli* connati.

KENYA COLONY: Aberdares Range, plain of Lake Ol'Bolossat, 2100 m., *Dowson* 562 (type); Uplands, from the edge of a swamp, 2040 m., *Edwards* 1648; cultivated at the Scott Agricultural Laboratories, originally obtained from Uplands, *Edwards* 1680 (in part).

Pennisetum (§ *Gymnothrix*) **salifex** *Stapf et C. E. Hubbard*, sp. nov.; affine *P. ripario* Hochst., sed spiculis majoribus, lemmati superiore 6–11-nervibus differt.

Gramen perenne, rhizomatibus et stolonibus repentibus multiramosis ; stolones longi, validi, usque ad 7 mm. lati, carnosi, glabri laevesque, multinodes, nodis radicantibus, internodiis 1·3–10 cm. longis. *Culmi* ascendentes, usque ad 30 cm. alti vel 60–90 cm. longi, moderate validi, compressi, simplices vel ramosi, pauci- vel multinodes, glabri laevesque. *Foliorum* vaginae imbricatae vel internodis breviores, breves, latae, compressae, carinatae, ore pilis paucis hirsutae vel glabrae ; ligulae ad seriem ciliorum redactae ; laminae lineares vel lineari-lanceolatae, apice subacutae vel callosae, 4–16 cm. longae, 4–10 mm. latae, planae vel complicatae vel marginibus involutis, firmae, virides vel leviter glaucae, glabrae vel sparse hirsutae, apice scaberulae, subtus laeves. *Spica spuria* laxiuscula vel densa, 2–6·5 cm. longa, 5–15 mm. lata (setis exclusis), pallida vel purpurea, pauci- vel multi-spiculata ; rhachis scaberula, denudata fulcris minutis involucrorum laxe obsita ; involucra subsessilia, basi minute barbata ; setae 20–30, gracillimae, inaequales, 1–3 interiorum ceteris validiores et usque ad 15 mm. longae, ceterae breviores. *Spiculae* solitariae vel binae, subsessiles, lanceolatae, acutae, 8–10·5 mm. longae, glabrae. *Glumae* hyalinae ; inferior oblata, 0·6 mm. longa, enervis, vel nulla ; superior oblata vel ovata vel ovato-oblonga, acuta vel obtusa, 2–3 mm. longa, 1–3-nervis. *Anthoecium inferum* ♂ vel plerumque sterile : lemma explanatum lanceolato- vel ovato-oblongum, acutum, spiculae subaequilongum, arcte 5–9-nerve, membranaceum ; palea oblonga, 7 mm. longa, carinis minute scaberulis, vel nulla. *Anthoecium superum* ⚥, lanceolatum, tenuiter acutum vel acuminatum : lemma explanatum lanceolato-ovatum, acutum, spiculae aequilongum, membranaceum, 6–11-nerve ; palea lemmati aequilonga, lanceolata. *Lodiculae* minutae vel nullae. *Antherae* 3–4 mm. longae, apicibus glabris. *Styli* connati.

UGANDA : Mt. Elgon ; Bukiga, etc., planted near native houses, 1350–1800 m., *Snowden* 1214 ; Butandiga, in short grass turf following cultivation and by roadsides, 2100 m., *Snowden* 1227 (type).

KENYA COLONY : cultivated at the Scott Agricultural Laboratories, originally obtained from Uplands, 2250 m., *Edwards* 1477 ; 1680 (in part).

TANGANYIKA TERRITORY : Kilimanjaro ; Mashami, Fau, 1500 m., *Haarer* 1007.

Vern. name : *Nabutwa* (Lugishu).

Pennisetum (§ *Gymnothrix*) **grandiflorum** *Stapf et C. E. Hubbard*, sp. nov. ; affine *P. ripario* Hochst., sed spiculis majoribus, culmis validioribus, laminis foliorum longioribus, spica spuria latiore, anthoecio infero sterili differt.

Gramen perenne (?) ; basis ignota. *Culmi* geniculato-ascendentes, usque ad 60 cm. longi, validi, usque ad 7 mm. lati, carnosi, compressi, simplices, plurinodes, infra spicam spuriam scaberuli, ceterum glabri laevesque. *Foliorum* vaginae internodiis longiores, latae, compressae, laeves, firmae, ore pilis paucis exceptis glabrae; ligulae ad seriem ciliorum densorum redactae; laminae lineares, in apicem obtusum attenuatae, usque ad 33 cm. longae, 5–10 mm. latae, complicatae vel planae, rigidiusculae, supra prominenter nervosae et glabrae vel pilis paucis obsitae, ad apicem scaberulae, ceterum laeves. *Spica spuria* cylindrica, densa, erecta, obtusa, 5–9 cm. longa, 10–18 mm. lata (setis exclusis), purpurea; rhachis subvalida, minute hispidula, scaberula, denudata fulcris minutissimis involucrorum laxe obsita; involucra subsessilia, basi minute barbata; setae 16–25, gracillimae, scaberulae, pallidae vel apicibus purpureis, inaequales, una vel duae interiorum ceteris validiores et usque ad 12–14 mm. longae, ceterae spicula plerumque breviores. *Spiculae* solitariae, raro 2–3-fasciculatae, sessiles, lanceolato-oblongae vel lanceolatae, acutae, 10–12 mm. longae, glabrae. *Gluma* inferior nulla vel minutissima; gluma superior oblata, truncata, 1 mm. longa, hyalina, enervis, vel nulla. *Anthoecium inferum* sterile: lemma explanatum lanceolato-ovatum vel ovatum, acutum, 4·5–6 mm. longum, tenuiter membranaceum, 1–5-nerve (nervis lateralibus brevibus); palea nulla. *Anthoecium superum* ☿, lanceolatum, acutum: lemma explanatum late ovatum vel oblongo-ovatum, acutum, spiculae aequilongum, membranaceum, 7–9-nerve; palea acuta, lemmati aequilonga. *Lodiculae* nullae. *Antherae* 4–5 mm. longae, apicibus glabris. *Styli* connati.

KENYA COLONY: Aberdares Range; Lari Swamp, 2250 m., *Battiscombe* 507 (type); Escarpment, *Linton* 183; Makindu, *Linton* 171.

Pennisetum (§ *Gymnothrix*) **catabasis** *Stapf et C. E. Hubbard*, sp. nov.; affine *P. Hohenackeri* Hochst., sed culmis paulo altioribus ramosis, apicibus antherarum acutis penicillatis differt.

Gramen perenne, dense caespitosum. *Culmi* erecti, 90–135 cm. alti, validi, rigidi, compressi, plerumque superne ramosi, ramis erectis nodis usque ad 9 vel pluribus, spicam spuriam versus scaberuli et nonnumquam pubescentes, ceterum glabri laevesque. *Foliorum* vaginae laevissimae, glabrae vel ore plerumque laxe barbatae, inferiores longae, valde compressae, carinatae, imbricatae, flabellatae, latae, pallidae vel suffuscae, coriaceae, superiores angustiores; ligulae ad seriem ciliorum densorum redactae; laminae anguste lineares vel lineares, oblique subacutae, usque ad 45 cm. longae et ad 5 mm. latae, arcte complicatae vel explanatae, rigidiusculae, durae, glaucae vel virides, glabrae, costa media et marginibus apicem versus scaberulae. *Spica spuria* densa, cylindrica, 10–25 cm. longa, 6–11 mm. lata (setis exclusis), pallide viridis vel purpureo-tincta; rhachis angulata, scaberula, denudata fulcris minutis subcupuliformibus involucrorum laxe obsita; involucra erecta vel leviter patentia, pedunculis minutis; setae 12–20, gracillimae, scaberulae, inaequales, terminalis ceteris validior et usque ad 2 cm. longa, ceterae breviores. *Spiculae* solitariae, sessiles, lanceolatae, acutae, 6·5–9 mm. longae, glabrae. *Gluma* inferior oblata, ovata vel oblonga, obtusa vel acuta, 0·5–2·5 mm. longa, hyalina, enervis vel uninervis; gluma superior anguste ovata vel elliptica, obtusa, 3–4·5 mm. longa, tenuiter membranacea, 1–3-nervis. *Anthoecium inferum* sterile: lemma explanatum oblongum vel late ovato-oblongum, obtusum, spiculae aequilongum, firme membranaceum, 7–11-nerve; palea usque ad 1·5 mm. longa, vel nulla. *Anthoecium superum* ⚥, lanceolatum, acutum: lemma explanatum oblongum vel ovato-oblongum, subacutum vel obtusum, spiculae aequilongum, firme membranaceum, 5–7-nerve; palea lanceolata, acuta, lemmate paulo brevior. *Lodiculae* minutae. *Antherae* 4–5 mm. longae, apicibus acutis penicillatis. *Styli* connati vel apicem versus liberi.

UGANDA: on the banks of Asua River, between Lira and Kitgum, 1020 m., *Liebenberg* 26.

KENYA COLONY: near Forest Station, in tussock grassland, 2290 m., *Fries* 655; Nakuru, 1890 m., *Taylor* 1296 (type); in the low land near a lake, *Hitchcock* 25096; Kinangop, in shallow black soil, 2100 m., *Edwards* 1457, *Turner* 1574A; Gilgil River, 2100 m., *Dowson*, *Scott Elliot* 6662; Nairobi, cultivated, *Lyne Watt* 12, *McDonald* 931; between Nairobi and Nanyuki, in grassland, *Hitchcock* 24750; Kabete, 1860 m., *Walker* 35; Sotik, common tussock-grass in patches in park country, 1800 m., *McDonald* 1081.

Vern. name: *Kikutu* (Kikuyu).

Pennisetum atrichum (§ *Brevivalvula*) *Stapf et C. E. Hubbard*, sp. nov.; affine *P. polystachyo* Schult., sed setis glabris vel fere glabris differt.

Gramen perenne; innovationes extravaginales. *Culmi* erecti vel leviter geniculati, usque ad 1·8 m. alti, validi, teretes, e nodis superioribus ramosi, nodis usque ad 8, spicam spuriam versus scaberuli, ceterum glabri laevesque. *Foliorum* vaginae internodiis breviores, laxae, laminam versus carinatae, striatae, laeves, glabrae vel marginibus ciliatae et ore laxe barbatae; ligulae brevissimae, truncatae, ciliatae; laminae lineares, basi angustatae, acutae, usque ad 45 cm. longae, 4–16 mm. latae, planae, firmae, virides, supra pilis brevibus e tuberculis ortis laxe hirsutae vel glabrae, scaberulae. *Spica spuria* densa, cylindrica, flexuosa vel stricta, 12–20 cm. longa, 6–8 mm. lata (setis exclusis), purpurea, purpurascenti-fusca vel aureo-fusca; rhachis angulata, angulis minute scaberula; involucra subsessilia, decidua, demum patentia vel deflexa, basi minute barbata; setae usque ad 25, gracillimae, scaberulae, raro pilis brevibus paucis praeditae, inaequales, terminalis ceteris validior et usque ad 2·6 cm. longa, ceterae usque ad 12 mm. longae. *Spiculae* solitariae, sessiles, lanceolato-oblongae, 3·5–4·5 mm. longae, glabrae, pallide fuscae. *Gluma* inferior lanceolata, obtusa vel acuta, usque ad 1·5 mm. longa, hyalina, enervis vel uninervis, vel nulla; gluma superior explanata ovato-oblonga, abrupte acuta, spiculae aequilonga, tenuiter membranacea, 5–7 (raro 9)-nervis, superne minute puberula. *Anthoecium inferum* ♂: lemma explanatum late oblongum, 3–3·5 mm. longum, breviter 3-lobum, lobis obtusis vel acutis aequalibus vel lobo medio longiore, tenuiter membranaceum, 5–7-nerve, supra medium minute puberulum; palea linearis, lemmati subaequilonga, carinis sparse ciliolatis vel scabridis. *Anthoecium superum* ☿, lanceolatum, obtusum: lemma explanatum late ovatum, truncatum, 2–2·5 mm. longum, chartaceum, laeve, nitens, obscure 5-nerve, apice ciliolatum; palea lemmati aequilonga, chartacea. *Lodiculae* nullae. *Antherae* 2 mm. longae, apicibus glabris. *Styli* liberi.

FRENCH GUINEA: Timbo, *Pobeguin* 1761 (in part).

NORTHERN NIGERIA: Borgu, Fakun, *Barter* 842; Naraguta, near water, *Lely* 439.

KENYA COLONY: 20 miles north of Mombasa, in moist sandy soils, *Grant* 878.

BELGIAN CONGO: Bas Congo; Thysville, *Vanderyst* 4469, 4473; Mombuttu, Kussumbo, *Schweinfurth* 3615; Upper Luapula, Tschinsenda, *Rogers* 10396a; Sakenia, *Mundy in S. Rhod. Govt. Herb.* 5036.

NYASALAND: Zomba, 1170 m., *Manning* 4 (type).

NORTHERN RHODESIA: near Mumbwa, *Macaulay* 26.

Pennisetum (§ *Penicillaria*) **darfuricum** *Stapf et C. E. Hubbard*, sp. nov.; affine *P. fallaci* Stapf et C. E. Hubbard, sed spiculis majoribus, setis interioribus involucrorum longioribus plumosis differt.

Gramen annuum. *Culmi* validi, subalti, ramosi, in latere ad ramum spectante canaliculati vel applanati, infra spicam spuriam dense pubescentes, ceterum glabri laevesque. *Foliorum* vaginae internodiis demum breviores, striatae, glabrae laevesque; ligulae ad seriem ciliorum densorum redactae; laminae lineares, usque ad 30 cm. (vel ultra) longae, 12–24 mm. latae, planae, pilis e tuberculis ortis sparse hirsutae, costa media valida, marginibus scabridis. *Spica spuria* cylindrica, subdensa, c. 15 cm. longa et 18 mm. lata (setis exclusis), pallida; rhachis dense pubescens, gracilis, denudata fulcris minutis involucrorum laxiuscule obsita; involucra sessilia, demum patentia; setae 70–90, gracillimae, exteriores inaequales, breviores, scaberulae, interiores (25–35) praeter apices spiculam superantes scaberulos pilis e tuberculis ortis dense sericeo-plumosae, terminalis ceteris validior et usque ad 20 mm. longa, ceterae subaequales usque ad 12 mm. longae. *Spiculae* solitariae, pedicellatae, pedicellis usque ad 1 mm. longis, lanceolatae vel lanceolato-oblongae, leviter gibbosae, 7–8 mm. longae, glabrae. *Glumae* latissimae, truncatae, hyalinae, enerves; inferior saepe nulla; superior usque ad 0·6 mm. longa. *Anthoecium inferum* ♂: lemma explanatum lanceolato-oblongum, obtusum, mucronatum, spiculae aequilongum, membranaceum, 3–4-nerve; palea lanceolata, minute truncata, lemmati aequilonga, dorso minute scaberula. *Anthoecium superum* ☿: lemma explanatum ovatum, acutum, spiculae aequilongum vel plerumque paulo brevius, tenuiter chartaceum, 5–7-nerve, prope margines scaberulum, dorso infra apicem prominenter nervosum laeve; palea lemmate paulo brevior, palea ei anthoecii inferioris similis sed firmior et carinis leviter scaberulis exceptis dorso laevis. *Lodiculae* nullae. *Antherae* 4 mm. longae, apicibus penicillatis. *Styli* connati.

SUDAN: Darfur; Meidob, in clay valley below Jebel Kaboija, in damp ground by water courses, *Michelmore*!

Vern. name: *Wiwi* (Arabic).

Pennisetum (§ *Penicillaria*) **ochrops** *Stapf et C. E. Hubbard*, sp. nov.; affine *P. fallaci* Stapf et C. E. Hubbard, sed setis interioribus involucrorum subaequalibus, lemmate inferiore elliptico-oblongo late emarginato vel truncato, lemmate superiore late ovato obtusissimo marginibus ciliolatis differt.

Gramen annuum. *Culmi* erecti, validi, usque ad 150 cm. alti, teretes vel in latere ad ramum spectante canaliculati, e nodis plurimis ramosi, nodis superioribus barbatis, spicam spuriam versus dense pubescentes, ceterum glabri laevesque. *Foliorum* vaginae internodiis breviores, apicem versus ciliatae vel glabrae, laeves; ligulae ad seriem ciliorum redactae, pilis densis usque ad 3 mm. longis; laminae lineares, basi abrupte contractae, tenuiter acutae, usque ad 60 cm. longae, 8–20 mm. latae, planae, firmae, glaucae, glabrae, marginibus fere laevibus. *Spica spuria* cylindrica, densissima, 7·5–10 cm. longa, 12 mm. lata (setis exclusis), pallida; rhachis gracilis, dense pubescens, denudata fulcris minutis involucrorum dense obsita; involucra sessilia, demum patentia vel deflexa; setae usque ad 80, gracillimae, exteriores valde inaequales, breviores, scaberulae, interiores (8) praeter apices spiculam superantes scaberulos pilis e tuberculis ortis ciliatae, subaequales, usque ad 9 mm. longae. *Spiculae* solitariae, minute pedicellatae, lanceolato-oblongae, leviter gibbosae, 4·5–5·5 mm. longae, fere glabrae. *Glumae* latissimae, truncatae vel rotundatae, hyalinae, enerves, usque ad 0·4 mm. longae, vel inferior nulla. *Anthoecium inferum* ♂ vel ad lemma redactum: lemma explanatum elliptico-oblongum, late emarginatum vel truncatum, spicula paulo brevius, mucronulatum, membranaceum, apice ciliolatum, 3–5-nerve, vel tenuissimum, 1–3-nerve et ad modum redactum; palea lineari-lanceolata, minute truncata, lemmati fere aequilonga, carinis scaberulis, vel nulla. *Anthoecium superum* ☿: lemma explanatum late ovatum, obtusissimum, palea leviter brevius, mucronatum, tenuiter coriaceum, 5–7-nerve, dorso infra apicem minute scaberulum prominenter nervosum laeve et nitens, marginibus ciliolatis; palea lanceolata, minute truncata, spiculam aequans. *Lodiculae* nullae. *Antherae* 3 mm. longae, apicibus penicillatis. *Styli* connati. *Caryopsis* oblonga, dorso compressa, 2 mm. longa.

NORTHERN NIGERIA: near Lake Chad, very common on sandy soil near Kukawa, also between Kauwa and Baga Seyoram, in patches between Gumnari and Bodoweri and between Kalkala and Marte, *Golding* 22.

Pennisetum (§ *Penicillaria*) **Rogeri** *Stapf et C. E. Hubbard*, sp. nov.; affine *P. mollissimo* Hochst., sed setis involucrorum rigidis crassioribus longioribus (usque ad 24 mm. longis), spiculis paulo majoribus, lemmate inferiore obtusissimo 3–5-nervi, lemmate superiore lanceolato-oblongo prope margines scaberulo differt.

Gramen annuum. *Culmi* erecti vel ascendentes, subalti, ramosi, nodis superioribus barbati, spicam spuriam versus dense pubescentes, ceterum glabri laevesque. *Foliorum* vaginae internodiis breviores, laminam versus scaberulae vel laeves, glabrae vel superne prope margines ciliatos pilis paucis e tuberculis ortis hirsutae; ligulae ad seriem ciliorum redactae, pilis densis usque ad 3 mm. longis; laminae lineares, basi contractae vel rotundatae, tenuiter acutae, usque ad 30 cm. longae, 8–12 mm. latae, planae, pilis brevibus e tuberculis ortis sparse hirsutae vel glabrescentes, supra scaberulae, marginibus cartilagineis scabridis. *Spica spuria* densa, cylindrica, setigera, flexuosa, 10–15 cm. longa, 12–18 mm. lata (setis exclusis), straminea vel fusca; rhachis moderate gracilis, villosula, denudata fulcris minutissimis involucrorum subdense obsita; involucra subsessilia, demum patentia; setae usque ad 80, graciles, rigidulae, inaequales, exteriores breviores et scaberulae, interiores (25–30) pilis longis albis e tuberculis ortis dense plumosae praeter apices spiculam superantes scaberulos, terminalis ceteris validior et usque ad 24 mm. longa, ceterae subaequales usque ad 6 mm. longae. *Spiculae* solitariae vel binae, pedicellatae, pedicellis usque ad 1·5 mm. longis, lanceolatae vel anguste oblongae, leviter gibbosae, 6·5–7 mm. longae. *Glumae* latissimae, truncatae vel obtusissimae, usque ad 0·6 mm. longae, hyalinae, enerves, ciliolatae, vel inferior nulla. *Anthoecium inferum* ♂, raro ⚥: lemma explanatum lanceolato-oblongum, obtusissimum, spiculae aequilongum, mucronatum, firme membranaceum, 3–5-nerve, apicem versus minute scaberulum; palea lanceolata, lemmate paulo brevior, minute scaberula. *Anthoecium superum* ⚥: lemma explanatum lanceolato-oblongum, obtusum, spiculae subaequilongum, mucronatum, tenuiter coriaceum, 5–7-nerve, prope margines supra medium scaberulum vel raro minute puberulum; palea lanceolata, minute truncata, lemmati subaequilonga. *Lodiculae* nullae. *Antherae* 4 mm. longae, apicibus penicillatis. *Caryopsis* oblonga, 2·5 mm. longa.

SENEGAL: without precise locality, in old cultivations and near habitations, *Roger* (type); Longa, in cultivated fields, *Chevalier* 33824.

Pennisetum (§ *Penicillaria*) **Chevalieri** *Stapf et C. E. Hubbard*, sp. nov.; affine *P. fallaci* Stapf et C. E. Hubbard, sed spica spuria validiore, setis terminalibus longioribus interioribus minus hirsutis, lemmate superiore ciliolato differt.

Gramen annuum (?); basis ignota. *Culmi* erecti, subvalidi, ramosi, in latere ad ramum spectante canaliculati, plurinodes, spicam spuriam versus dense pubescentes et infra nodos dense seriatim albo-pilosos leviter pubescentes. *Foliorum* vaginae teretes, internodiis breviores, superne pilis rigidis patentibus e tuberculis ortis laxe hirsutae vel plus minusve glabrescentes vel glabrae, sed plerumque ad summum dorsum dense barbatae ; laminae lineares, basi paulo contractae, usque ad 45 cm. (vel ultra) longae et ad 2 cm. latae, planae, firmae, virides, pilis brevibus e tuberculis ortis laxe hirsutae, marginibus cartilagineis scabridis, costa media valida. *Spica spuria* densa, cylindrica, 15 cm. longa, 14 mm. lata (setis exclusis), flavido-fusca, setosa ; rhachis teres, c. 1·5 mm. lata, dense pubescens, denudata fulcris minutis involucrorum densiuscule obsita ; involucra sessilia, basi minute barbata, demum deflexa ; setae usque ad 70, gracillimae, rigidiusculae, inaequales, exteriores scaberulae et breviores, interiores (5–8) praeter apices spiculam superantes scaberulos ciliatae, terminalis ceteris validior, stricta vel paulo curvata et usque ad 3 cm. longa, ceterae inaequales usque ad 14 mm. longae. *Spiculae* solitariae, minute pedicellatae, lanceolato- vel ovato-oblongae, leviter gibbosae, 5·5–6 mm. longae, fere glabrae. *Gluma inferior* nulla vel minutissima ; gluma superior rotundata, latissima, usque ad 0·6 mm. longa, hyalina et enervis. *Anthoecium inferum* ♂ : lemma explanatum ovato-oblongum, apice late emarginatum vel obtusissimum, mucronulatum, spiculae aequilongum, firme membranaceum, 4–5-nerve ; palea lanceolata, lemmati aequilonga, dorso sparse pilosa, carinis scaberulis. *Anthoecium superum* ⚥ : lemma explanatum late ovatum, obtusissimum, spiculae subaequilongum, mucronatum, chartaceum vel tenuiter coriaceum, 5-nerve, dorso infra apicem prominenter nervosum laevissimum et nitens, marginibus basin versus rigide ciliolatum ; palea lanceolata, acuminata, lemmati fere aequilonga, glabra vel basi pilis minutis praedita. *Lodiculae* nullae. *Antherae* 3·5 mm. longae, apicibus penicillatis. *Styli* connati.

NORTH BAGIRMI : Kolkélé and Moito, *Chevalier* 9757 bis.

Pennisetum (§ *Penicillaria*) **robustum** *Stapf et C. E. Hubbard*, sp. nov. ; affine *P. Chevalieri* Stapf et C. E. Hubbard, sed spiculis minoribus, spica spuria plerumque validiore usque ad 30 cm. longa et ad 2·5 cm. lata, lemmate inferiore plerumque trinervi, lemmate superiore prope margines scaberulo vel minute pubescente differt.

Gramen annuum, usque ad 3 m. altum. *Culmi* erecti vel geniculato-ascendentes, validi, ramosi, teretes vel in latere ad ramum spectante canaliculati, plurinodes, pilis deciduis e tuberculis ortis plerumque dense hirsuti vel glabri, nodis superioribus serie pilorum longorum densorum sericeorum obsitis. *Foliorum* vaginae internodiis plerumque breviores, laxae, teretes, striatae, pilis rigidis patentibus e tuberculis ortis hirsutae vel plus minusve glabrescentes et tuberculatae ; ligulae ad seriem ciliorum densorum redactae, pilis usque ad 5 mm. longis ; laminae lineares, basi contractae, tenuiter acutae, usque ad 30 cm. (vel ultra) longae et ad 2·5 cm. latae, planae, firmae, uti vaginae hirsutae vel fere glabrae, marginibus cartilagineis scabridis, costa media valida. *Spica spuria* valida, densa, cylindrica, setosa, 10–30 cm. longa, 11–24 mm. lata (setis exclusis), aurea, demum fusca vel purpureo-tincta ; rhachis valida, teres, usque ad 4 mm. diametro, dense pubescens, denudata fulcris minutis pubescentibus involucrorum sublaxe obsita ; involucra sessilia vel subsessilia, demum patentia vel deflexa ; setae 50–60, gracillimae, rigidae, inaequales, exteriores breviores et scaberulae, interiores (6–16) praeter apices spiculam superantes scaberulos pilis albis ciliatae, terminalis usque ad 2·8 cm. longa et ceteris validior, ceterae usque ad 14 mm. longae. *Spiculae* binae vel solitariae, pedicellatae, pedicellis usque ad 1 mm. longis, lanceolatae, oblongae vel ovato-oblongae, paulo gibbosae, 3·5–4·5 mm. longae, fere glabrae. *Glumae* tenuissimae ; inferior ovata, obtusa, 0·5-0·7 mm. longa, enervis, vel nulla ; superior oblata vel elliptica, truncata vel obtusissima, usque ad 3 mm. longa, enervis vel 1–3-nervis. *Anthoecium inferum* ♂ vel sterile : lemma explanatum ovato-oblongum vel oblongum, apice late emarginatum vel truncatum, spiculae aequilongum vel plerumque paulo brevius, firme membranaceum, 3–5-nerve, apicem versus nervis scaberulum, vel usque ad 1·5 mm. longum et 1–3-nerve redactum ; palea linearis vel anguste lanceolata, obtusa, lemmati fere aequilonga, dorso minute hirsuta, carinis scaberulis, vel nulla. *Anthoecium superum* ⚥ : lemma explanatum late ovatum, obtusum vel truncatum, spiculae aequilongum, mucronulatum, chartaceum, tenuiter coriaceum, 5–6-nerve, prope margines supra medium scaberulum et nonnunquam minute pubescens, dorso infra apicem prominenter nervosum laeve et nitens ; palea lemmati aequilonga, dorso tenuiter coriacea et glabra, marginibus tenuibus basin versus minute hirsuta vel glabra, carinis scaberulis. *Lodiculae* nullae. *Antherae* 2 mm. longae, apicibus penicillatis. *Styli* connati. *Caryopsis* oblongo-ellipsoidea vel oblongo-ovoidea, transverse subrotunda vel dorso paulo compressa, 2–2·5 mm. longa, inter lemma paleamque inclusa.

ANGOLA : Cuanza Norte, Casoneca, perhaps an escape from cultivation, *Gossweiler* 8324 (type) ; Loanda, in thickets between Penedo and Conceiçao, *Welwitsch* 7278 ; Loanda, rather rare in fields once cultivated and in abandoned gardens, *Welwitsch* 7321 ; Golungo Alto, near Sange, in grassy places, *Welwitsch* 7275 ; between Sange and Menha-Lula, on grassy hills, *Welwitsch* 7276 ; spontaneous on the left bank of the Quiapose stream near Sanches, *Welwitsch* 7276 b.

Vern. name : *Massango.*

Welwitsch notes that this grass is cultivated by the natives and more rarely by the settlers, but that it also is spontaneous everywhere.

Pennisetum (§ *Penicillaria*) **Barteri** *Stapf et C. E. Hubbard*, sp. nov. ; affine *P. violaceo* L. Rich., sed culmis altioribus, spica spuria longiore albido-sericeo, setis tenuioribus differt.

Gramen annuum (?) ; basis ingota. *Culmi* graciles, 1·2 m. alti, compressi, ramosi, in latere ad ramum spectante canaliculati, spicam spuriam versus pubescentes, ad nodos pilis albis sericeis barbati, ceterum glabri laevesque. *Foliorum* vaginae (superiores) internodiis breviores, striatae, pilis brevibus deciduis e tuberculis ortis laxe hirsutae, os versus ad margines ciliatae, ad dorsum summum serie pilorum sericeorum praeditae ; ligulae ad seriem ciliorum densorum redactae, pilis usque 3 mm. longis ; laminae lineares, basi paulo contractae, acutae, usque ad 15 cm. (vel ultra) longae et ad 10 mm. latae, planae vel complicatae, firmae, sparse hirsutae, supra scaberulae, marginibus cartilagineis laevibus. *Spica spuria* densa, cylindrica, albido-sericea, 10–11 cm. longa, 12 mm. lata (setis exclusis) ; rhachis gracilis, villosula, denudata fulcris minutis involucrorum densiuscule obsita ; involucra sessilia, demum patentia ; setae usque ad 75, subcapillares, mollissimae, exteriores scaberulae et breviores, interiores (20–22) praeter apices scaberulos spiculam superantes pilis albis sericeis plumosae, terminalis ceteris paulo validior et usque ad 13 mm. longa, ceterae subaequales et usque ad 9 mm. longae. *Spiculae* solitariae, pedicellatae, pedicellis usque ad 1·2 mm. longis, ambitu anguste lanceolatae, dorso lanceolatae et acutae, 4–4·5 mm. longae, glabrae. *Glumae* nullae vel superior minutissima, hyalina. *Anthoecium inferum* sterile : lemma oblatum, usque ad 0·5 mm. longum, hyalinum, uninerve vel enerve ; palea nulla. *Anthoecium superum* ⚥ : lemma explanatum ovatum, late obtusum, spiculae aequilongum, mucronulatum, apicem versus marginibus tenuibus exceptis chartaceum, 5-nerve, dorso laeve et nitens, apicem versus prominenter nervosum et asperulum ; palea lanceolata, minute truncata, lemmati aequilonga, glabra laevisque. *Lodiculae* nullae. *Antherae* c. 2 mm. longae, apicibus penicillatis. *Styli* connati.

NORTHERN NIGERIA : Nupe, in cultivated fields, *Barter* 1376.

Pennisetum (§ *Penicillaria*) **sclerocladum** *Stapf et C. E. Hubbard*, sp. nov. ; affine *P. stenostachyo* Stapf et C. E. Hubbard, sed spica spuria validiore, setis terminalibus longioribus, lemmati inferiore late elliptico- vel ovato-oblongo, lemmate superiore latiore marginibus pubescentibus differt.

Gramen annuum. *Culmi* laxe fasciculati, suberecti, 90–120 cm. alti, subvalidi, teretes vel in latere ad ramum spectante canaliculati, simplices vel ramosi, 4–5-nodes, spicam spuriam versus dense pubescentes, nodis superioribus plerumque breviter barbati, ceterum glabri laevesque. *Foliorum* vaginae teretes, internodiis breviores, firmae, glabrae vel ad dorsum summum minute barbatae ; ligulae ad seriem ciliorum densorum redactae, pilis usque ad 3 mm. longis ; laminae lineares, basi leviter contractae, acutae, usque ad 15 cm. longae (superiores) et ad 1 cm. latae, planae, firmae, glauco-virides, glabrae laevesque, marginibus cartilagineis, costa media gracili. *Spica spuria* densa, cylindrica, 9–23 cm. longa, 13–14 mm. lata (setis exclusis), aurea, demum pallide fusca ; rhachis teres, usque ad

2·5 mm. lata, dense pubescens vel villosa, denudata fulcris minutis involucrorum dense obsita; involucra subsessilia, basi minute barbata, demum leviter deflexa; setae usque ad 80, gracillimae, rigidulae, inaequales, exteriores scaberulae et breviores, interiores (5–10) praeter apices spiculam superantes scaberulos ciliatae, terminalis ceteris validior et usque ad 18 mm. longa, ceterae inaequales et usque ad 10 mm. longae. *Spiculae* binae vel solitariae, pedicellatae, pedicellis usque ad 0·5 mm. longis, lanceolatae, late ovatae vel elliptico-oblongae, 4–4·5 mm. longae, leviter gibbosae. *Glumae* rotundatae, subaequales vel inferior brevior vel nulla, usque ad 1 mm. longae, apice ciliolatae, hyalinae, enerves vel superior 2-nervis. *Anthoecium inferum* ♂ vel sterile: lemma explanatum late elliptico- vel ovato-oblongum, truncatum vel emarginatum, spiculae aequilongum vel brevius, firme membranaceum, 3–5 nerve, apice ciliolatum, vel plus minusve redactum usque ad 1·5 mm. longum et tenuius; palea anguste elliptica, truncata, lemmati aequilonga, adpresse pubescens, carinis scaberulis, vel nulla. *Anthoecium superum* ⚥: lemma explanatum late ovatum, obtusissimum, spiculae aequilongum, mucronulatum, tenuiter coriaceum, 5-nerve, prope margines pubescens, infra apicem prominenter nervosum scaberulum laeve et nitens; palea lanceolata vel ovata, obtusa, lemmati subaequilonga, adpresse pubescens, apice ciliolata. *Lodiculae* nullae. *Antherae* 1·5 mm. longae, apicibus penicillatis. *Styli* connati. *Caryopsis* ellipsoidea vel obovoidea, 2–2·5 mm. longa, inter lemma paleamque inclusa.

GAMBIA: near Georgetown, in cultivated fields, *Sampson* 56.

Pennisetum (§ *Penicillaria*) **Sampsonii** *Stapf et C. E. Hubbard*, sp. nov.; affine *P. Perrottetii* K. Schum., sed culmis altioribus, laminis latioribus firmioribus, spica spuria gracili, setis brevioribus tenuioribus, spiculis brevioribus, anthoecio infero sterili differt.

Gramen annuum. *Culmi* erecti, usque ad 2·7 m. alti, validi, usque ad 1 cm. lati, basi paulo compressi, ramosi, nodis usque ad 12, superne teretes vel in latere ad ramum spectante canaliculati, spicam spuriam versus pubescentes, ad nodos plerumque pilosi vel villosi, ceterum glabri laevesque. *Foliorum* vaginae internodiis plerumque breviores, teretes, validae, laeves, os versus ciliatae, ad dorsum summum saepe dense barbatae, ceterum glabrae; ligulae brevissimae, truncatae, pilis sericeis usque ad 4 mm. longis dense ciliatae; laminae lanceolato-lineares, basi abrupte contractae vel paulo rotundatae, acutae, usque ad 1·2 m. longae et ad 3·5 cm. latae, planae, firmae, basin versus pilis e tuberculis ortis laxe hirsutae, ceterum glabrae, leviter scaberulae vel subtus laeves, marginibus cartilagineis minute serrato-scabridis, costa media valida. *Spica spuria* densa, cylindrica, 10–18 cm. longa, 10–12 mm. lata, sericea, purpurea; rhachis gracilis, teres, dense pubescens vel villosula, denudata fulcris minutissimis involucrorum dense obsita; involucra subsessilia, demum patentia; setae usque ad 60–80, gracillimae, exteriores scaberulae et breviores, interiores (20–24) apicibus scaberulis exceptis pilis albis vel purpureis sericeis e tuberculis ortis plumosae, subaequales, spiculis subaequilongae vel leviter longiores. *Spiculae* solitariae vel binae, minute pedicellatae, anguste lanceolatae vel ovato-oblongae, acutae, leviter gibbosae, 3·5–4 mm. longae. *Glumae* oblatae, apice ciliolato rotundatae, hyalinae, enerves; inferior usque ad 0·5 mm. longa vel nulla; superior usque ad 0·6 mm. longa. *Anthoecium inferum* sterile: lemma late oblongum vel oblatum, apice ciliolato truncatum vel rotundatum, usque ad 2·5 mm. longum, tenuiter membranaceum, 3–4-nerve; palea nulla. *Anthoecium superum* ⚥: lemma explanatum late ovatum, obtusissimum, spiculae aequilongum, mucronulatum, 5-nerve, marginibus membranaceis exceptis tenuiter coriaceum, prope margines pubescens, dorso infra apicem nervosum laeve et nitens; palea lanceolata, minute truncata, lemmati aequilonga, dorso coriaceo excepto adpresse pubescens. *Lodiculae* nullae. *Antherae* 2–2·5 mm. longae, apicibus penicillatis. *Styli* connati. *Caryopsis* obovoida, 2 mm. longa, inter lemma paleamque inclusa.

NORTHERN NIGERIA: Ilorin, in cultivated land, *Sampson* 44.

Pennisetum (§ *Penicillaria*) **Dalzielii** *Stapf et C. E. Hubbard*, sp. nov.; affine *P. Gymnothrici* K. Schum., sed spica spuria longiore, spiculis ovato-oblongis brevioribus, lemmate superiore late ovato-elliptico ad margines pubescentibus differt.

Gramen annuum (?); basis ignota. *Culmi* erecti, usque ad 2·5 m. alti, validi, superne ramosi, teretes vel in latere ad ramum spectante canaliculati, plurinodes, ad nodos plus minusve barbati, spicam spuriam versus dense pubescentes vel villosi, ceterum plerumque glabri laevesque. *Foliorum* vaginae internodiis breviores, teretes, os versus ad margines ciliatae, ad dorsum summum saepe dense barbatae, vel glabrae, laeves vel superiores laminam versus minute scaberulae; ligulae ad seriem ciliorum densorum redactae, pilis 3–6 mm. longis; laminae lineares, basi leviter contractae vel attenuatae, tenuiter acutae, usque ad 45 cm. (vel ultra) longae, 12–24 mm. latae, planae, rigidiusculae, virides, pilis brevibus e tuberculis ortis sparse hirsutae vel glabrae, scaberulae vel subtus laeves, marginibus plus minusve scabridis. *Spica spuria* cylindrica, densa, erecta, 11–25 cm. longa, 12–16 mm. lata (setis exclusis), straminea vel purpurea; rhachis valida, teres, villosa, denudata fulcris minutis involucrorum densiuscule obsita; involucra sessilia, demum patentia vel deflexa; setae usque ad 60, gracillimae, inaequales, scaberulae, interiores usque ad 10 mm. longae vel una ceteris paulo validior et usque ad 12 mm. longa, ceterae breviores. *Spiculae* binae vel ternae, minute pedicellatae, ovato-oblongae vel oblongae, 4·5–6·5 mm. longae, leviter gibbosae. *Glumae* oblongae vel elliptico-oblongae, obtusissimae vel rotundatae, ciliolatae, tenuissimae; inferior nulla vel usque ad 1 mm. longa, enervis; superior usque ad 3 mm. longa, enervis vel uninervis. *Anthoecium inferum* ♂: lemma explanatum oblongum, truncatum vel emarginatum, spiculae subaequilongum, plerumque mucronulatum, firme membranaceum, 3–5-nerve, apice ciliolatum; palea linearis, truncata, lemmati aequilonga, carinis scaberulis et pilis paucis praedita. *Anthoecium superum* ⚥: lemma explanatum late ovato-ellipticum, late obtusum vel apice rotundatum, spiculae aequilongum, mucronulatum, chartaceum, 5–7-nerve, prope margines breviter pilosum, infra apicem prominenter nervosum scaberulum laeve et nitens; palea lemmati aequilonga, firma, basin versus leviter pilosa. *Lodiculae* nullae. *Antherae* usque ad 4 mm. longae, apicibus penicillatis. *Styli* connati.

NORTHERN NIGERIA: Sokoto Province, *Dalziel* 511, 512 (type), 513.

Vern. name: *Shibra* or *Shura*.

Pennisetum (§ *Penicillaria*) **perspeciosum** *Stapf et C. E. Hubbard*, sp. nov.; affine *P. vulpino* Stapf et C. E. Hubbard, sed spiculis longioribus, fasciculis pedunculatis, spica spuria longiore differt.

Gramen annuum (?); basis ignota. *Culmi* validi, alti, ramosi, ramis erectis, teretes, spicam spuriam versus villosi, ad nodos serie pilorum densorum praediti, ceterum glabri laevesque. *Foliorum* vaginae, laxae, teretes, internodiis longiores, striatae, glabrae laevesque; ligulae ad seriem cilorum redactae; laminae lanceolatae, basi contractae, acutae, usque ad 60 cm. (vel ultra) longae et ad 3 cm. latae, planae, firmae, scaberulae vel subtus fere laeves, glabrae, costa media valida. *Spica spuria* densa, ambitu lineari-lanceolata, 24 cm. longa, 22 mm. lata (setis inclusis), subfusca; rhachis moderate valida, teres, villosa, pedunculis villosis usque ad 5 mm. longis involucrorum persistentium leviter patentium densiuscule obsita; setae usque ad 50, gracillimae, inaequales, exteriores scaberulae, interiores (6–10) praeter apices spiculam superantes scaberulos pilis e tuberculis ortis laxe plumosae, subaequales et spiculae aequilongae, ceterae plerumque breviores. *Spiculae* solitariae vel binae, pedicellatae, pedicellis usque ad 1 mm. longis, lanceolatae vel anguste oblongae, 7–8·5 mm. longae, fere glabrae. *Glumae* oblatae, truncatae vel rotundatae, usque ad 1·2 mm. longae, hyalinae, enerves. *Anthoecium inferum* ♂: lemma explanatum ovato-oblongum vel oblongum, subacutum vel obtusum et mucronatum, spiculae fere aequilongum, firme membranaceum, 3–4-nerve, nervis scaberulis; palea lineari-lanceolata, minute truncata, lemmati fere aequilonga, carinis scaberulis. *Anthoecium superum* ⚥: lemma explanatum ovatum, subacutum vel obtusum et mucronatum, spiculae aequilongum, chartaceum, 7-nerve, infra apicem prominenter nervosum laeve et nitens, prope margines scaberulae et pilis brevibus paucis praeditum; palea linearis, lemmati fere aequilonga. *Lodiculae nullae*. *Antherae* 4 mm. longae, apicibus penicillatis. *Styli* connati.

SUDAN: near Berber (El Mecherif), cultivated, *Schweinfurth* 643 (in part).

Pennisetum perspeciosum var. **Lynesii** *Stapf et C. E. Hubbard*, var. nov.

Pedunculus (internodium summum) infra spicam spuriam tenuiter striatus et fere glabrus. *Spica spuria* 18 cm. longa, 22 mm. lata (setis exclusis), pallide viridis et setis purpureis; setae 15–18, interiores leviter inaequales, usque ad 15 mm. longae, circiter quorum 8 praeter apices spiculam superantes plumosae. *Anthoecium inferum*: lemma truncatum, mucronatum, 5-nerve. *Anthoecium superum*: lemma glabrum, 9-nerve. *Caryopsis* late obovata, dorso compressa, 3 mm. longa, inter lemma et paleam inclusa.

SUDAN: Blue Nile, cultivated, *Lynes* (type in Herb. Mus. Brit.).

Pennisetum (§ *Penicillaria*) **orthochaete** *Stapf et C. E. Hubbard*, sp. nov.; affine *P. perspecioso* Stapf et C. E. Hubbard, sed setis terminalibus rigidis valde elongatis, fasciculis breviter pedunculatis differt.

Gramen annuum (?); basis ignota. *Culmi* erecti, alti, validi, ramosi, in latere ad ramum spectante canaliculati vel complanati, plurinodes, ad nodos superioribus breviter barbati, spicam spuriam versus dense pubescentes, ceterum glabri laevesque. *Foliorum* vaginae internodiis demum breviores, laxae, teretes, glabrae laevesque; ligulae ad seriem ciliorum densorum redactae, pilis usque ad 5 mm. longis; laminae lineares, basi leviter contractae, tenuiter acutae, usque ad 60 cm. (vel ultra) longae et 24 mm. latae, planae, firmae, glabrae, virides, subtus laeves, supra et ad margines scaberulae, costa media valida. *Spica spuria* densa, cylindrica sed superne attenuata, usque ad 30 cm. longa et 22 mm. lata (setis exclusis), setosa, straminea; rhachis valida, teres, tuberculata, dense pubescens, fulcris minutis involucrorum laxe obsita; involucra demum patentia, pedunculis usque ad 1·5 mm. longis; setae usque ad 50, gracillimae, rigidulae, inaequales, exteriores scaberulae, interiores (4–9) inferne pilis longis e tuberculis ortis laxe ciliatae, superne scaberulae, terminalis ceteris multo validior et usque ad 28 mm. longa, ceterae usque ad 11 mm. longae. *Spiculae* solitariae vel raro binae, pedicellatae, pedicellis usque ad 1 mm. longis, lanceolatae et acutae vel oblongae et hiantes, 8–9 mm. longae, leviter gibbosae, glabrae. *Gluma* inferior nulla; gluma superior oblata, truncata, c. 1 mm. longa, membranacea, enervis. *Anthoecium inferum* ♂: lemma explanatum oblongum vel lanceolato-oblongum, subacutum, mucronulatum, 7–8 mm. longum, firme membranaceum, 4–7-nerve, nervis apicem versus scaberulis; palea linearis, minute truncata, lemmate paulo brevior, carinis scaberulis. *Anthoecium superum* ⚥: lemma explanatum late elliptico-lanceolatum vel elliptico-ovatum, acuminatum, mucronatum, spiculae aequilongum, chartaceum, 7–9-nerve, dorso infra apicem prominenter nervosum scaberulum laeve et nitens; palea lanceolata, minute truncata, c. 7 mm. longa, dorso chartacea. *Lodiculae* nullae. *Antherae* 4·5–5 mm. longae, apicibus penicillatis. *Styli* connati.

SUDAN: near Berber (El Mecherif), cultivated, *Schweinfurth* 643 (in part).

Pennisetum (§ *Penicillaria*) **niloticum** *Stapf et C. E. Hubbard*, sp. nov.; affine *P. vulpino* Stapf et C. E. Hubbard, sed spica spuria longiore, spiculis plerumque brevioribus, setis brevioribus differt.

Gramen annuum. *Culmi* validi, 1·8–2·4 m. alti, nodis superioribus dense barbati, spicam spuriam versus tomentosi. *Foliorum* vaginae (superiores) teretes, firmae, ad dorsum summum dense barbatae, ceterum glabrae laevesque; ligulae ad seriem ciliorum densorum redactae, pilis usque 4 mm. longis; laminae lanceolatae, basi plerumque rotundatae, tenuiter acutae, usque ad 60 cm. (vel ultra) longae, 20–32 mm. latae, planae, firmae, pilis e tuberculis ortis hirsutae vel glabrae, supra scaberulae vel marginibus cartilagineis scabridis exceptis laeves. *Spica spuria* densa, cylindrica, 15–23 cm. longa, 14–16 mm. lata (setis exclusis), straminea, aurea vel purpurascens; rhachis valida, teres, dense tomentosa, denudata fulcris minutis involucrorum dense obsita; involucra sessilia vel minutissime pedunculata, demum patentia vel deflexa; setae usque ad 90, gracillimae, exteriores scaberulae et breviores, interiores (usque ad 30) apicibus scaberulis exceptis plumosae, subaequales et usque ad 7 mm. longae vel terminalis usque ad 9 mm. longa. *Spiculae* solitariae vel binae, minute pedicellatae, oblongae vel ovato-oblongae, leviter gibbosae, 4–5·5 mm. longae. *Glumae* oblatae, truncatae, hyalinae, minute ciliolatae, enerves; inferior 0·5–0·6 mm. longa; superior 0·6–1 mm. longa. *Anthoecium inferum* ♂: lemma explanatum oblongum vel elliptico-oblongum, apice latum et leviter emarginatum, spicula paulo brevius, firme membranaceum, 4–5-nerve, apicem ciliolatum versus scaberulum; palea lanceolato-oblonga, truncata, adpresse pubescens vel glabra. *Anthoecium superum* ⚥: lemma explanatum late ovatum, obtusissimum, mucronatum, spiculae aequilongum, tenuiter coriaceum, 5-nerve, prope margines breviter pilosum, infra apicem prominenter nervosum laeve et nitens; palea lemmati aequilonga, angusta, firma, basi pilosa vel glabra. *Lodiculae* nullae. *Antherae* 3 mm. longae, apicibus penicillatis. *Styli* connati.

SENEGAMBIA: Galom, *Heudelot* 299 (in part).

CAMEROONS: Adamaua; Bidene, *Houy* 13.

SUDAN: Blue Nile; Fazogl (?), *Figari* (type); Gallabat; Matamma, *Schweinfurth* 1516 (Herb. Kew).

Also in Egypt (*Bové* 275, 276). Cultivated.

It may be pointed out that the species of *Pennisetum* (sect. *Penicillaria*) here described (from *P. ancylochaete* to *P. gibbosum*) are artificially defined groups rather than natural species. They have been given binominal names for brevity and convenience, and for the same reasons that guided one of us in the treatment of the corresponding artificial units of *Sorghum*, sect. *Eu-sorghum*, in the Flora of Tropical Africa (**9**, pt. 1, 105). They may be useful as provisional centres around which the agriculturist may group the numerous minor cultivated strains which he encounters in the pearl-millet fields, pending a better understanding of their genetic relationships. They come under the general but equally artificial concept of Koernicke's *Pennisetum spicatum*. The species of *Pennisetum* which precede them in this article (*P. robustum* to *P. niloticum*) are so far known only from cultivated ground, and represent types which appear to be independent units, some of them intruders into cultivation and others reversions to wild types.

Pennisetum (§ *Penicillaria*) **ancylochaete** *Stapf et C. E. Hubbard*, sp. nov.; affine *P. pycnostachyo* Stapf et C. E. Hubbard, sed spiculis plerumque solitariis paulo majoribus, lemmate superiore 7–9-nervi, fasciculis subsessilibus vel brevissime pedunculatis, setis terminalibus curvatis differt.

Gramen annuum. *Culmi* validi, teretes, ad nodum superiorem pilosi, spicam spuriam versus dense pubescentes. *Foliorum* vaginae teretes, striatae, ad margines ciliatae, ad dorsum summum dense barbatae, ceterum glabrae laevesque; ligulae ad seriem ciliorum densorum redactae; laminae basi contractae, 2·4 cm. latae, glabrae, subtus laeves, supra et ad margines scaberulae. *Spica spuria* cylindrica, densa, setosa, stricta, rigida, 45 cm. longa, 2 cm. lata (setis exclusis), atropurpurea; rhachis valida, 6 mm. lata, teres, dense pubescens, pedunculis dense pubescentibus usque ad 1 mm. longis involucrorum persistentium patentium dense obsita; setae usque ad 65, exteriores scaberulae, gracillimae, breviores, interiores validiores, quorum 3–5 basin versus sparse ciliatae, superne scaberulae, terminalis ceteris multo validior curvata et 12–18 mm. longa, ceterae usque ad 9 mm. longae. *Spiculae* plerumque solitariae, rarissime binae, pedicellatae, pedicellis 1·5 mm. longis, elliptico-oblongae, 4–4·5 mm. longae. *Glumae* late oblongae vel oblatae, truncatae, subaequales, c. 2 mm. longae, hyalinae, enerves, ciliolatae. *Anthoecium inferum* ♂: lemma explanatum latissime oblongum, truncatum vel leviter emarginatum, spiculae aequilongum, firme membranaceum, 7–8-nerve, apice ciliolatum; palea oblonga, truncata, lemmati subaequilonga, adpresse pilosa. *Anthoecium superum* ⚥: lemma explanatum latissime ovato-ellipticum vel subrotundum, mucronulatum, spiculae aequilongum, 7–9-nerve, tenuiter coriaceum, dorso infra apicem laeve et nitens, supra medium prope margines pilosum; palea lemmati subaequilonga, firma, adpresse pilosa.

NORTHERN NIGERIA: Katagum District, cultivated, *Dalziel* 294.

Pennisetum (§ *Penicillaria*) **albicauda** *Stapf et C. E. Hubbard*, sp. nov.; affine *P. echinuro* Stapf et C. E. Hubbard, sed spica spuria pallida, spiculis majoribus, caryopsi quam lemma et palea conspicue breviore, lemmate superiore chartaceo marginibus tenuibus differt.

Gramen annuum. *Culmi* validi, usque ad 2·5 m. alti, infra spicam spuriam dense pilosi. *Folia* glabra. *Spica spuria* moderate densa, subcylindrica, apicem et basin versus attenuata, 21–28 cm. longa, 22–30 mm. lata (setis exclusis), pallida; rhachis valida, teres, pilosa, pedunculis patentibus involucrorum persistentium densiuscule obsita; pedunculi 5–7 mm. longi, pilis longis patentibus laxe pilosi;

setae usque ad 70, gracillimae, exteriores breviores et scaberulae, interiores (12–18) apicibus scaberulis exceptis pilis longis e tuberculis ortis laxe plumosae, terminalis ceteris validior et 10–28 mm. longa basin versus plumosa, ceterae spiculae aequilongae vel usque ad 14 mm. longae. *Spiculae* 2–5-nae fasciculatae, pedicellatae, pedicellis 2 mm. longis, late oblongae vel elliptico-oblongae, 4·5-6 mm. longae. *Glumae* latissimae, truncatae vel obtusissimae, hyalinae vel tenuiter membranaceae; inferior usque ad 0·6 mm. longa, enervis; superior usque ad 2·5 mm. longa, enervis vel 1–4-nervis. *Anthoecium inferum* ♂: lemma explanatum late elliptico-oblongum, apice latum et leviter emarginatum, spicula paulo brevius, membranaceum, marginibus tenuibus, 5–7-nerve, apice ciliolatum; palea lemmati aequilonga, lanceolato- vel elliptico-oblonga, plus minusve adpresse pilosa. *Anthoecium superum* ⚥: lemma explanatum late ovatum, obtusissimum, mucronatum, spiculae aequilongum, 5–7-nerve, chartaceum, supra basin prope margines pubescens, dorso infra apicem prominenter nervosum laeve et nitens; palea lemmati subaequilonga, plus minusve adpresse pilosa. *Caryopsis* late obovoidea vel obovoideo-ellipsoidea, 2·5–3 mm. longa, inter lemma et paleam hiantes inclusa.

SOUTH WEST AFRICAN PROTECTORATE: Ovamboland, cultivated, *Hahn.*

Vern. name: *Omuhango.*

Pennisetum (§*Penicillaria*) **malacochaete** *Stapf et C. E. Hubbard*, sp. nov.; affine *P. echinuro* Stapf et C. E. Hubbard, sed anthoecio infero plerumque sterili, lemmate inferiore plerumque 1–1·5 mm. longo, spica spuria cylindrica, pedunculis 2–6 mm. longis differt.

Gramen annuum. *Culmi* validi, ad nodum supremum barbati, infra spicam spuriam tomentosi, ceterum glabri. *Foliorum* vaginae ad dorsum summum dense barbatae; ligulae ad seriem ciliorum densorum redactae; laminae lanceolato-lineares, acutae, usque ad 45 cm. longae et 2 cm. latae, glabrae, supra scaberulae. *Spica spuria* densa, cylindrica, setosa, 10–23 cm. longa, 13–24 mm. lata (setis exclusis), fusca vel purpurea; rhachis valida, usque ad 5 mm. lata, teres, dense pubescens; involucra persistentia, patentia vel deflexa, pedunculis pilosis 2–6 mm. longis suffulta; setae usque ad 70, exteriores gracillimae scaberulae breviores, interiores (6–12) molles, praeter apices spiculam superantes scaberulos ciliatae, terminalis ceteris validior et 12–26 mm. longa, ceterae usque ad 7–13 mm. longae. *Spiculae* plerumque binae, pedicellatae, pedicellis 1·5–2 mm. longis, lanceolato-oblongae vel oblongae, 3–4 mm. longae, fere glabrae. *Gluma* inferior nulla vel minutissima; gluma superior oblata, truncata, usque ad 0·5 mm. longa, hyalina, enervis. *Anthoecium inferum* plerumque sterile, raro ♂: lemma oblatum vel latissime elliptico-oblongum, truncatum vel leviter emarginatum, mucronulatum, 1–1·5 mm. longum, glabrum, 3–7-nerve, raro ovato-oblongum et spiculae aequilongum; palea raro lemmati aequilonga et inter carinas laxe pilosa, plerumque nulla. *Anthoecium superum*

☿ : lemma explanatum late ovatum, obtusissimum, mucronatum, spiculae aequilongum, 5–7-nerve, tenuiter coriaceum, supra medium prope margines scaberulum et pilis minutis paucis praeditum, dorso nitens et laeve ; palea basin versus leviter pilosa. *Caryopsis* ellipsoidea, 3 mm. longa, 1·5 mm. lata, inter lemma et paleam hiantes breviter exserta.

TANGANYIKA TERRITORY : Daressalam, Usonga, *Holz* 578 ; Noto Plateau, *Busse* 2918 ; Lindi, *Busse* 2331 ; Rovuma, *Kirk* (type).

Cultivated near the Rovuma River.

Pennisetum (§ *Penicillaria*) **leonis** *Stapf et C. E. Hubbard*, sp. nov. ; affine *P. nigritarum* Durand & Schinz, sed setis interioribus (6–10) plumosis, spiculis paulo brevioribus, lemmate inferiore 3–5-nervi, superiore 5-nervi, caryopsibus oblanceolatis vel anguste ellipticis acutis vel obtusis transverse rotundis differt.

Gramen annuum. *Culmi* validi, 1·8–3·0 m. alti, simplices vel leviter ramosi, spicam spuriam versus villosi. *Foliorum* vaginae marginibus ciliatae, ad dorsum summum dense barbatae, vel glabrae ; ligulae ad seriem ciliorum longorum redactae ; laminae lanceolato-lineares, acutae, usque ad 60 cm. (vel ultra) longae et 3·6 cm. latae, glabrae. *Spica spuria* densissima, cylindrica, rigida, 20–45 cm. longa, 14–30 mm. lata, pallida ; rhachis valida, teres, usque ad 1 cm. lata, villosa ; involucra patentia, subpersistentia, pedunculis pilosis 1–7 mm. longis suffulta ; setae usque ad 50, gracillimae, rigidae, exteriores scaberulae et breviores, interiores subaequales, usque ad 5 mm. longae, 6–10 apicibus scaberulis exceptis ciliatae vel plumosae. *Spiculae* plerumque binae, vel solitariae, pedicellatae, pedicellis c. 1 mm. longis, oblongae vel elliptico-oblongae, 3–4·5 mm. longae. *Glumae* latae, truncatae vel obtusissimae, tenuiter membranaceae, ciliolatae ; inferior 0·5–0·6 mm. longa, enervis ; superior 1–1·5 mm. longa, 1–3-nervis. *Anthoecium inferum* ♂ vel sterile : lemma explanatum late oblongum vel elliptico-oblongum, truncatum, spiculae aequilongum, 3–5-nerve, firme membranaceum, ciliolatum, nonnunquam prope margines pubescens, vel plus minusve redactum ; palea lanceolato-oblonga, lemmati aequilonga, adpresse pilosa, vel nulla. *Anthoecium superum* ☿ : lemma explanatum latissime ovatum vel ovato-ellipticum, obtusissimum, mucronulatum, spiculae aequilongum, 5-nerve, coriaceum, supra basin prope margines dense pilosum, dorso laeve et nitens ; palea lemmati aequilonga, dorso coriaceo excepto pilosa. *Caryopsis* ambitu oblanceolata vel anguste elliptica, acuta vel obtusa, transverse rotunda, 3–5 mm. longa, 1·5–2 mm. lata, ex apicibus lemmatis paleaeque distincte exserta.

SIERRA LEONE : Njala, *Deighton* 1796 (type) ; Port Lokko, *Sampson* 49 ; Kamalu, *Thomas* 350 ; without precise locality, *Afzelius*, *Glanville*.

Vern. names : *Gbele-Nuie* (Mende) ; *Tasure* (Temne).

The chief pearl millet cultivated in Sierra Leone.

Pennisetum (§ *Penicillaria*) **gambiense** *Stapf et C. E. Hubbard*, sp. nov.; affine *P. nigritarum* Durand & Schinz, sed setis interioribus (6–18) ciliatis, spiculis brevioribus, caryopsibus transverse rotundis obtusis differt.

Gramen annuum. *Culmi* validi, 2·7–3·6 m. alti. *Foliorum* vaginae marginibus ciliatae, ad dorsum summum dense barbatae, vel glabrae; ligulae ad seriem ciliorum densorum redactae; laminae lineares, acutae, usque ad 60 cm. (vel ultra) longae et 2·5 cm. latae, glabrae. *Spica spuria* cylindrica, densissima, rigida, 30–60 cm. longa, 15–36 mm. lata, flavida; rhachis valida, teres, usque ad 1 cm. lata, villosa; involucra patentia, persistentia, pedunculis dense pilosis 2–8 mm. longis suffulta; setae usque ad 90, gracillimae, ridigae, exteriores scaberulae et breviores, interiores validiores, subaequales, 6–18 usque ad 4 mm. ciliatae, usque ad 5·5 mm. longae. *Spiculae* 2–3-nae fasciculatae, pedicellatae, pedicellis 1 mm. longis, oblongae vel elliptico-oblongae, 3·5–4 mm. longae. *Glumae* latae, obtusissimae vel truncatae, tenuiter membranaceae, ciliolatae; inferior 1–1·5 mm. longa, enervis; superior 1·5–1·8 mm. longa, 1–3-nervis. *Anthoecium inferum* ♂: lemma explanatum late elliptico-oblongum, apice latum leviter emarginatum vel truncatum, spicula paulo brevius, 5–7-nerve, firme membranaceum, ciliolatum; palea anguste elliptico-oblonga, lemmati aequilonga, pilosa. *Anthoecium superum* ⚥: lemma explanatum latissime ellipticum, obtusissimum, mucronulatum, spiculae aequilongum, 5–7-nerve, coriaceum, prope margines dense pilosum, dorso laeve et nitens; palea lemmati aequilonga, pilosa. *Caryopsis* turbinata, late vel anguste obovoidea, vel pyriformis, transverse rotunda, 3·2–4 mm. longa, e lemmati et palea exserta.

GAMBIA: throughout the country, *Pirie* 5, *Director of Agriculture* 13 (type), 14, 15, *Boteler*.

GOLD COAST: without precise locality, *Thomas*.

Cultivated throughout Gambia.

Vern names:—*Suno, Sunno, Sanyo, Konba Sanyo* (Mandingo and Tarino).

Pennisetum (§ *Penicillaria*) **Maiwa** *Stapf et C. E. Hubbard*, sp. nov.; affine *P. nigritarum* Durand & Schinz, sed setis interioribus dense plumosis, lemmate inferiore prope margines pubescentibus vel pilosis apice ciliatis, lemmate superiore prope margines dense barbatis, caryopsibus late obovoideo-globosis differt.

Gramen annuum. *Culmi* erecti, 1·8–2·7 m. alti, validi, simplices, nodis usque ad 7 superioribus serie pilorum densorum praeditis, spicam spuriam versus tomentosi, ceterum glabri laevesque. *Foliorum* vaginae internodiis plerumque breviores, marginibus ciliatae, ad dorsum summum dense barbatae, ceterum glabrae vel pilis e tuberculis ortis laxe hirsutae; ligulae ad seriem ciliorum longorum redactae; laminae lineares, acutae, usque ad 60 cm. (vel ultra) longae et 3 cm. latae, glabrae. *Spica spuria* densissima, cylindrica, 25–45 cm. longa, 13–20 mm. lata (setis inclusis), canescens;

rhachis valida, dense villosa; involucra patentia, persistentia, pedunculis dense pilosis 1–4 mm. longis suffulta; setae usque ad 70, gracillimae, rigidulae, exteriores scaberulae et breviores, interiores (10–25) pilis sericeis dense plumosae vel apice scabridae, subaequales et usque ad 7 mm. longae. *Spiculae* solitariae vel binae, pedicellatae, pedicellis 1–1·5 mm. longis, elliptico-oblongae, 3–5·5 mm. longae. *Glumae* hyalinae, ciliolatae; inferior late oblonga, truncata, 0·5–1·2 mm. longa, enervis; superior oblata, rotundata, 0·6–2·4 mm. longa, enervis vel trinervis. *Anthoecium inferum* ♂: lemma explanatum late elliptico-oblongum, apice latum et leviter emarginatum, spicula paulo brevius, firme membranaceum, 5–7-nerve, prope margines pubescens vel breviter pilosum, apice ciliatum; palea oblonga, truncata, lemmati aequilonga, dense et adpresse pilosa. *Anthoecium superum* ⚥: lemma explanatum late elliptico-ovatum, obtusissimum, mucronatum, spiculae aequilongum, tenuiter coriaceum, 5–9-nerve, prope margines dense pilosum, dorso laeve et nitens; palea lemmati aequilonga, firma, dense pilosa. *Caryposis* late obovoideo-globosa, 2–2·6 mm. longa, 2 mm. lata.

SOUTHERN NIGERIA: Kafanshan, *Sampson* 41 (type).

NORTHERN NIGERIA: Ilorin, *Sampson* 43; Yandev, *Sampson* 32; Katagum District, *Dalziel* 295.

Vern. name: *Maiwa.*

This pearl millet has more densely hairy bristles and lemmas than any other commonly cultivated type.

Pennisetum (§ *Penicillaria*) **cinereum** *Stapf et C. E. Hubbard,* sp. nov.; affine *P. nigritarum* Durand & Schinz, sed spica spuria multo breviore ambitu lineari-lanceolata, pedunculis longioribus, setis interioribus (5–7) laxe plumosis, spiculis minoribus differt.

Gramen annuum. *Culmi* validi, ad nodum supremum breviter barbati vel glabri, spicam spuriam versus dense tomentosi, ceterum glabri. *Foliorum* vaginae pilis e tuberculis ortis hispidae vel glabrescentes vel superiores marginibus ciliatis et ad dorsum summum dense barbatum exceptis glabrae; ligulae ad seriem ciliorum densorum redactae; laminae lineari-lanceolatae, usque ad 75 cm. longae et 2·5 cm. latae, hispidae vel glabrae, scaberulae, marginibus spinuloso-scabridis. *Spica spuria* densa, ambitu lineari-lanceolata, 12–20 cm. longa, 20–22 mm. lata, cinerascens vel purpureo-tincta; rhachis moderate valida, dense villosa; involucra patentia, persistentia, pedunculis villosis usque ad 8 mm. longis suffulta; setae 25–40, gracillimae, rigidulae, exteriores scaberulae et breviores, interiores subaequales, usque ad 5 mm. longae, 5–7 apicibus scaberulis exceptis laxe ciliatae. *Spiculae* 2–3-fasciculatae, pedicellatae, pedicellis 1 mm. longis, oblongae vel elliptico-oblongae, 3–4 mm. longae. *Glumae* truncatae, hyalinae, apice ciliolatae; inferior oblonga, 0·5–1 mm. longa, enervis; superior oblata, 0·6–1·2 mm. longa, enervis vel trinervis. *Anthoecium inferum* ♂: lemma explanatum late elliptico-oblongum, apice leviter emarginatum, mucronulatum, spicula paulo brevius, firme membranaceum, 3–5-nerve, apice ciliatum ; palea anguste oblonga, truncata, lemmate paulo longior, adpresse pilosa, apice ciliata. *Anthoecium superum* ☿ : lemma explanatum latissime ovatum, obtusissimum, mucronatum, spiculae aequilongum, tenuiter coriaceum, 5–7-nerve, dorso laeve et nitens, prope margines dense pilosum ; palea lemmati aequilonga, firma, pilosa. *Caryopsis* obovoidea vel pyriformis, 3·5–4 mm. longa, 3 mm. lata.

GOLD COAST : Tamale, cultivated, *Sampson* 5 (type) ; Northern Territories, cultivated *Williams* 520.

Pennisetum (§ *Penicillaria*) **gibbosum** *Stapf et C. E. Hubbard*, sp. nov. ; affine *P. nigritarum* Durand & Schinz, sed culmis et spica spuria multo brevioribus, spiculis minoribus differt.

Gramen annuum. *Culmi* erecti, usque ad 90 cm. alti, graciles, 3–4-nodes, compressi, ramosi, ramis erectis, ad nodos superiores plerumque breviter barbati, ad inferiores glabri vel pubescentes, spicam spuriam versus tomentosi vel villosi. *Foliorum* vaginae laxae, pilis patentibus e tuberculis ortis hirsutae, vel ad margines ciliatis et dorso summo barbato exceptis glabrae (vaginae superiores) ; ligulae ad seriem ciliorum densorum redactae ; laminae lineari-lanceolatae, basi contractae, acutae, 10–20 cm. longae, 8–11 mm. latae, planae, pilis brevibus e tuberculis ortis hirsutae, supra et ad margines scaberulae. *Spica spuria* densa, cylindrica, 3–7·5 cm. longa, 7–13 mm. lata, pallida vel purpurea ; rhachis gracilis, teres, dense villosa ; involucra persistentia vel decidua, subsessilia vel pedunculis usque ad 2 mm. longis suffulta, patentia ; setae usque ad 50, gracillimae, inaequales, exteriores scaberulae et breviores, interiores (usque ad 10) apicibus scaberulis exceptis plumosae, subaequales et usque ad 6 mm. longae, raro omnino scaberulae. *Spiculae* plerumque solitariae, raro binae, minute pedicellatae, oblongae vel late ellipticae, 3–4·5 mm. longae. *Glumae* latae, rotundatae vel truncatae, tenues, ciliolatae, enerves vel paucinerves, inferior usque ad 1 mm., superior usque ad 1·5 mm. longa, aut inferior vel utraque suppressa. *Anthoecium inferum* ♂ vel sterile : lemma explanatum late elliptico-oblongum, truncatum vel leviter emarginatum, spicula paulo brevius, firme membranaceum, 3–5-nerve, apice ciliolatum, vel ad squamam minutam tenuissimam redactum ; palea elliptico-oblonga, truncata, lemmati aequilonga vel eo brevior, adpresse pilosa vel glabrescens, vel nulla. *Anthoecium superum* ☿ : lemma explanatum latissime elliptico-ovatum, obtusissimum, mucronulatum, spiculae aequilongum, coriaceum, 5–9-nerve, prope margines pilosum vel pubescens vel scaberulum, dorso laeve et nitens; palea infero similis. *Caryopsis* late obovoidea, 3 mm. longa, 2·5 mm. lata, gibbosa, inter apices hiantes lemmatis paleaeque exposita.

NORTHERN NIGERIA : cultivated on the banks of Lake Chad, *Lamb* 109.

Vern. name : *Beri-beri* (Ligi).

Cenchrus perinvolucratus *Stapf et C. E. Hubbard*, sp. nov. ; affinis *C. cathartico* Delile, sed setis exterioribus magis numerosis erectis vel leviter patentibus, interioribus dorso plerumque pubescentibus, spiculis paulo majoribus, gluma inferiore 1–3-nervi, gluma superiore 5-nervi differt.

Gramen annuum. *Culmi* erecti vel geniculato-ascendentes, nonnunquam basi decumbentes et e nodis inferioribus radicantes, 20–75 cm. alti, graciles, leviter compressi, simplices vel ramosi, 4–6-nodes, spicam spuriam versus scabridi, ceterum glabri laevesque. *Foliorum* vaginae compressae et carinatae, basalibus exceptis laevibus scaberulae, superiores internodiis breviores; ligulae ad seriem brevem ciliorum redactae; laminae lineares, tenuiter acutae, usque ad 20 cm. longae, 4–8 mm. latae, planae, glabrae, scaberulae. *Spica spuria* densa, cylindrica, 5·5–11·5 cm. longa, 12–14 mm. lata; rhachis angulata, flexuosa, scaberula; involucra minutissime pedunculata, erecta, 6–9 mm. longa; setae numerosae, basi connatae, exteriores rigidae, teretes, spiniformes, demum patentes, inaequales, usque ad 4 mm. longae, retrorse scabridae, interiores (10–12) ceteris validiores, usque ad 8 mm. longae, deorsum incrassatae et ampliatae, infra medium ad marginem ciliatae, dorso 2–3-nerves, glabrae vel plerumque pubescentes, apice leviter patentes retrorse scabridae. *Spiculae* binae, sessiles, ovatae, acutae, 4–6 mm. longae. *Glumae* tenuiter membranaceae, apicem versus puberulae; inferior ovata, acuta, c. 3 mm. longa, 1–3-nervis; superior elliptico-ovata vel late ovata, obtusa, 3–4 mm. longa, 5-nervis. *Anthoecium inferum* sterile, raro ♂: lemma gluma superiore simile, sed 3·5–5 mm. longum, obtusissimum, nonnunquam mucronulatum; palea lanceolata, acuta, usque ad 5 mm. longa, carinis retrorse scabridis, vel nulla. *Anthoecium superum* ☿, ovatum, acuminatum: lemma explanatum late ovatum, subobtusum, mucronatum, spiculae aequilongum, demum crustaceum, 5–7-nerve; palea ovata, lemmati aequilonga. *Antherae* 4 mm. longae. *Caryopsis* elliptico-oblonga, truncata, 2·5 mm. longa.

ZANZIBAR: on bare sandy ground, *Hildebrandt* 1094 (type). Fumba; in clumps just above high water mark, in sand, also on Pemba, *Greenway* 1227.

TANGANYIKA TERRITORY: Daressalam, sandy soil, *Marshall* 48.

PORTUGUESE EAST AFRICA: Port Amelia, *Young*.

Isachne aethiopica *Stapf et C. E. Hubbard*, sp. nov.; affinis *I. mauritianae* Kunth, sed laminis supra saepe scaberulis vel infra saepissime pilosis, spiculis leviter majoribus, glumis late ovatis vel ovato-ellipticis differt.

Gramen perenne. *Culmi* geniculato-ascendentes, e nodis inferioribus radicantes, usque ad 60 cm. alti, graciles, teretes, multinodes, laxe ramosi, glabri laevesque. *Foliorum* vaginae plerumque internodiis breviores, teretes, arcte appressae, demum laxae, marginibus plerumque ciliolatae, ceterum glabrae laevesque, superne raro pubescentes; ligulae ad seriem ciliorum redactae; laminae lanceolato-lineares vel lanceolatae, basim abrupte contractam versus attenuatae, acutae vel subacutae, 3–15 cm. longae, 4–12 mm. latae, planae, firmae, supra arcte nervosae et nervis scaberulis vel laevibus, plerumque pilis appressis paucis aspersae, subtus inter nervos secondarios plerumque 4 vel 5 papillis acutis vel tuberculis piligeris plus minus dense obsitae, pilis brevibus vel elongatis, marginibus cartilagineis minute scaberulis. *Panicula* elliptica, elliptico-oblonga vel latissime ovata, laxissima, 12·5–25 cm. longa, 7·5–15 cm. lata; rhachis gracilis, laevis vel minute scaberula; rami oblique patentes, solitarii, gracillimi, laxe divisi, ramulis patentibus, leviter flexuosi, minute scaberuli, inferiores usque ad 12 cm. longi; pedicelli apice incrassati, inaequales, laterales usque ad 6 mm. longi, terminales usque ad 1 cm. longi. *Spiculae* ambitu late ellipticae vel elliptico-oblongae, e dorso late ellipticae vel obovato-ellipticae, obtusae vel plerumque apiculatae, 1·3–1·8 mm. longae, pallide virides vel stramineae. *Glumae* aequales, spiculae aequilongae, convexae, membranaceae, glabrae pilis minutissimis paucis apicem versus sitis exceptis; inferior explanata late ovata vel late ovato-elliptica, obtusa, 5–7-nervis; superior inferiore similis sed latior et 7–9-nervis. *Anthoecium inferum* ♂ or ⚥, ambitu semi-ellipticum: lemma late ellipticum, apice rotundatum, 1–1·4 mm. longum, coriaceum, plerumque glabrum, obscure 5-nerve; palea lemmati aequilonga, glabra. *Anthoecium superum* ♀, infero simile sed leviter brevius et nonnunquam basi et marginibus pilis minutissimis paucis asperum. *Antherae* 0·6 mm. longae.

ST. THOMAS ISL.: Peak of St. Thomas, at the summit, *Mann*; Peak of St. Thomas, Macambrara, Lagoa Amelia, St. Nicholas, *Moller* 132 (in part).

UGANDA: Toro, 1500 m., *Snowden* 66; Masaka, near Mpungwe, in forest-clearing, 1200 m., *Snowden* 1389.

KENYA COLONY: Aberdare Range and base of Mt. Kenia, *Dowson* 75; Mt. Kenia, *R. E. & Th. Fries* 1727.

TANGANYIKA TERRITORY: Usambara, Gonja, *Holst* 4242; Amani, common in cleared areas in evergreen rain-forest, 900 m., *Greenway* 1671 (type); Kilimanjaro, 2100 m., *Johnston* 9; Marangu, 2200 m., *Volkens* 1285.

Isachne Gossweileri *Stapf et C. E. Hubbard*, sp. nov.; affinis *I. kiyalaensi* Robyns, sed spiculis minoribus, laminis lineari-lanceolatis differt.

Gramen perenne. *Culmi* ascendentes, usque ad 45 cm. (vel ultra) alti, graciles, teretes, multinodes, glabri laevesque. *Foliorum* vaginae internodiis multo breviores, striatae, laxiusculae, teretes, marginibus ciliolatis, ore pilosae, ceterum glabrae laevesque; ligulae ad seriem ciliorum redactae; laminae lineari-lanceolatae, basi contractae, subacutae, usque ad 5 cm. longae, 3–5·5 mm. latae, planae, firmae, virides, supra scaberulae et arcte nervosae, subtus pilis appressis e tuberculis minutis ortis sparse hirsutae, marginibus cartilagineis scaberulis vel fere laevibus. *Panicula* ovata, laxa, 5·5–9·5 cm. longa; rhachis gracilis, leviter flexuosa, laevis; rami solitarii, demum patentes, laeves, rigidiusculi, divisi, ramulis brevibus appressis vel leviter patentibus, inferiores usque 3 cm. longi; pedicelli apice leviter incrassati, inaequales, 0·5–2 mm. longi. *Spiculae* ambitu late ellipticae vel late ovato-ellipticae, e dorso ellipticae, usque ad 1·5 mm. longae, pallide virides vel purpureotinctae. *Glumae* subaequales, spiculae fere aequilongae, explanatae late ellipticae et obtusae vel inferior angustior, convexae, membranaceae, glabrae pilis minutissimis apicem versus sitis exceptis, tenuiter 5-nerves vel superior 7-nervis. *Anthoecium inferum* ♀ vel ⚥: lemma late ellipticum, obtusum, spiculae aequilongum, chartaceum, obscure 5-7-nerve, basi pilis paucis minutissimis exceptis glabrum; palea lemmati aequilonga, glabra. *Anthoecium superum* ♀, ambitu semi-ellipticum, e dorso late ellipticum et obtusum, minutissime pedicellatum: lemma circiter 1 mm. longum, tenuiter coriaceum, minute pubescens; palea lemmati aequilonga, glabra. *Antherae* 0·6 mm. longae.

ANGOLA: Cuanza Norte; sources of the River Bengo, Camabatela, humid situation in shade, *Gossweiler*, 7334.

Isachne guineensis *Stapf et C. E. Hubbard*, sp. nov; affinis *I. kiyalaensi* Robyns, sed spiculis majoribus hiantibus e dorso anguste ellipticis, laminis lineari-lanceolatis subglaucis differt.

Gramen perenne. *Culmi* ascendentes, e nodis inferioribus radicantes, plus 30 cm. longi, moderate graciles, simplices vel inferne ramosi, subteretes, plurinodes, glabri laevesque. *Foliorum* vaginae laxae, teretes, striatae, glabrae laevesque, inferiores internodiis longiores, superiores breviores; ligulae ad seriem ciliorum brevium redactae; laminae lineari-lanceolatae, basi leviter rotundatae, subacutae, usque ad 12·5 cm. longae et 1 cm. latae, planae, firmae, supra laeves et arcte nervosae, subtus minute hispidulae vel glabrescentes, marginibus minute scaberulis. *Panicula* laxa, circiter 7·5 cm. longa; rhachis gracilis, leviter flexuosa, laevis; rami laxe divisi, laeves; pedicelli valde inaequales, laterales usque ad 2 mm. longi, terminales usque ad 8 mm. longi. *Spiculae* hiantes, e dorso anguste ellipticae, circiter 2·5 mm. longae, apice purpureae. *Glumae* subaequales, spiculae fere aequilongae, membranaceae, obscure 5-7-nerves, glabrae pilis minutissimis paucis apicem versus sitis exceptis; inferior explanata elliptica, obtusa; superior inferiori similis sed leviter latior. *Anthoecium inferum* ♂ vel ⚥: lemma elliptico-oblongum, obtusum, spiculae aequilongum, firme membranaceum, basi pilis paucis minutissimis exceptis glabrum, obscure 5-nerve; palea lemmati aequilonga, glabra. *Anthoecium superum* ♀, ambitu late semi-ellipticum, e dorso ovato-ellipticum et obtusum, minutissime pedicellatum: lemma 1·5 mm. longum, tenuiter coriaceum, dorso glabrescente excepto minutissime pubescens; palea lemmati aequilonga, dorso minutissime pubescens. *Antherae* 1 mm. longae.

FRENCH GUINEA: between Mali and Mt. Loura, in a stream, 1450 m., *Chevalier* 34601.

XXXVI—FASTIGIATE AND PYRAMIDAL LARCHES.

W. DALLIMORE.

In *K.B.* 1929, 97–105, Mr. W. J. Bean gave an account of numerous trees of fastigiate and pyramidal habit which were growing in the Royal Botanic Gardens, Kew, and later, in the same year, the late Mr. Vicary Gibbs supplemented the article with another (op. cit. 285–287), directing attention to additional kinds that were growing at Aldenham.

The trees enumerated included both broad-leaved species and conifers, but no mention was made of either a fastigiate or a pyramidal larch, and I have not found such trees recorded amongst forms that have been singled out for definite varietal names.

However, within the last year two forms of the European larch, *Larix decidua* Mill. (*L. europaea* DC.), have been found, one with a very definitely fastigiate habit, the other distinctly pyramidal. In addition, a pyramidal form of the American larch, *Larix laricina* K. Koch, has developed at Bedgebury.

The fastigiate form of *L. decidua* is a tree 6½ feet high which was found by Sir Arthur Hill, in May 1932, growing amongst other larches in " The Warren," Mortimer Forest, one of the new forests planted by H.M. Forestry Commission. By the courtesy of Sir Roy Robinson, Chairman of the Forestry Commission, the young tree has been sent to Kew accompanied by two smaller specimens found by Mr. A. P. Long, Divisional Officer, one of fastigiate habit, and the other pyramidal.

The pyramidal form of *L. laricina* is one of six young trees planted at Bedgebury in March 1925. It has been much more compact in habit than the other five from its earliest days, and is now a tree 11 feet high of markedly formal appearance.

In order to place these trees on record they are named as follows :—

Larix decidua forma **fastigiata** *Dallimore*, form. nov. ; a typo habitu fastigiato differt.

A form of European larch identical with the type except in habit. It is an erect tree with a definite central stem from which the branches are borne at a very acute angle, giving it a close and compact habit resembling that of the Lombardy poplar. Sir Arthur Hill had no difficulty in picking out the larger tree from amongst many thousands of European larch by its stiff, formal appearance.

Larix decidua forma **pyramidalis** *Dallimore*, form. nov. ; a typo habitu pyramidale differt.

A European larch differing from the type in habit, and forming an erect tree with a good central stem. The branches are produced almost at right angles, but after growing horizontally for a few inches they turn upwards, forming a branch system of pyramidal outline.

Larix laricina forma **pyramidalis** *Dallimore*, form. nov.; a typo habitu pyramidale differt.

This form has all the characters of *L. laricina* except habit, which is similar to that of *L. decidua* forma *pyramidalis*.

XXXVII—MISCELLANEOUS NOTES.

I. B. POLE EVANS.—We record with pleasure the conferment by the University of the Witwatersrand of the Honorary Degree of Doctor of Science on Dr. I. B. Pole Evans, C.M.G., M.A., D.Sc., F.L.S., Chief of the Division of Plant Industry, Department of Agriculture, Pretoria. The ceremony, which took place in the presence of a large audience in the City Hall at Johannesburg on March 25th, was performed by the Vice-Chancellor, Mr. H. J. Hofmeyr.

MRS. POPENOE.—We regret to record the death on December 31st, 1932, of Mrs. Wilson Popenoe (Dorothy K. Hughes) at Guatemala City. From 1918–1923 Miss Hughes worked in the Herbarium at Kew as Temporary Technical Assistant, mainly aiding Dr. Stapf in his work on the Grasses. Gifted with keen perception and considerable artistic skill for illustration, she carried out independent research work in her own time and published several papers.

In 1923 she went to America where she took up work in the Bureau of Plant Industry at Washington, D.C., and afterwards married Mr. Wilson Popenoe of the same Department.

The Romance of Plant Hunting.*—All those interested in plant collecting and the enrichment of our gardens will welcome the appearance of Captain Kingdon Ward's well-known book in this cheap and attractive form. An appendix has been added giving the plant names under their field numbers, which should be useful to horticulturists who are cultivating Captain Ward's plants. The text, with its mixture of racy narrative and botanical description, remains unchanged.

---

*By Captain F. Kingdon Ward. London, Edward Arnold & Co. First published in The Kingfisher Library, 1933. Pp. x + 277. Illustrated. Price 3*s*. 6*d*.

Printed under the authority of HIS MAJESTY'S STATIONERY OFFICE,
By the South Essex Recorders, Ltd., High Road, Ilford.

(350) Wt. 92/33 925 8/33 S.E.R. Ltd. Gp. 9

BULLETIN OF MISCELLANEOUS
INFORMATION No. 7 1933
ROYAL BOTANIC GARDENS, KEW

XXXVIII—VARIABILITY IN STOCK-POISON PLANTS.

F. N. Howes.

In recent years there has been a gradual but steady increase in various parts of the world in the interest taken in plants poisonous or injurious to live-stock. This may be attributed to a number of causes. In most of the important ranching and stock-raising regions the number of animals grazed per unit area is now considerably in excess of that which was customary a few decades past. This is so much so in some areas that the grazing is admittedly continuously overstocked. Such overstocking does much to increase the incidence of plant-poisoning, for animals are then prone to consume unwholesome or harmful plants which, under more normal conditions, they would not touch. Furthermore, overstocking frequently results in the course of time in a steady diminution in some, if not all, of the more desirable species, while less palatable plants, some of which may be toxic if consumed in sufficient quantity, gradually increase. Another factor that has contributed to the interest in stock-poison plants is that the number of well bred and valuable stock has increased substantially in most areas and many farms and ranches that formerly carried only inferior or low grade stock now have at least a nucleus of more highly priced stud animals. Naturally with improved stock of this sort the possibility of vegetable poisoning assumes a more serious aspect and deaths resulting therefrom involve greater financial loss. It frequently happens also that the more valuable stock, particularly animals imported from other areas, are more prone to fall victims to plant poisoning than are the locally bred animals or native stock. It has been demonstrated experimentally[24] that low grade native stock require considerably larger quantities of certain poisonous plants to produce fatal results than do well bred animals. In addition, imported animals are often less discriminating than those locally bred and may consume harmful plants that are left untouched by other animals. Factors such as these have naturally led to an active spirit of enquiry among state departments and stock-owners regarding the nature of the plants that lead to loss and the conditions that predispose to it.

Losses due to plant-poisoning appear to be greatest in the more arid subtropical parts of the world. In such areas, for example parts of South Africa, Australia, and the South Western United

States of America, the aggregate mortality is without question higher and of greater seriousness than in pastoral regions in temperate countries. In some areas of the United States the annual losses due to poisonous plants are regarded as being considerably in excess of those caused by infectious diseases or predatory animals. There it has been estimated [19, 21] that the average loss must be as high as 3–4 per cent. while losses among individual herds may be as high as 50–60 per cent. due to "death camas" (*Zygadenus* spp.) or others of the more dangerous species.

It is in these arid or semi-arid areas, where the vegetation is subject to unusually varied climatic and edaphic conditions, with irregular rainfall and often prolonged conditions of drought, that the question of variability in toxicity among poisonous plants (i.e., variability in the same species) is becoming so apparent. Generally speaking, stock-raising is not of great significance in tropical countries with the exception perhaps of India. The fact that there does not appear to be much vegetable poisoning in India—apart from *Sorghum* poisoning and criminal or intentional poisoning by plant agency which it is not proposed to consider—may possibly be due to the breeds employed being for the most part indigenous to the country and not of exotic origin as in most other cattle-raising countries.

Intensive experimental work has been, and is being, carried out on stock-poisoning plants in various countries, especially South Africa, Australia and several parts of the United States. In many instances the problems confronted are of an involved and complex nature. Diagnosis in vegetable poisoning is often complicated by the fact that the symptoms produced by some plants are closely similar to those caused by certain bacterial diseases or other pathological disorders. It is believed by veterinarians and others that many of the obscure affections of live-stock that at present baffle solution will eventually be traced to plant agency. Some species of poisonous plants affect the animal in a distinctive and characteristic manner, the effects being quite unlike those produced by other poisonous plants. On the other hand different species occurring in different countries may cause a strangely similar type of poisoning. This is becoming increasingly noticeable among plants whose toxicity is of the cumulative type, i.e., where poisoning does not take place until a fairly large quantity of the plant has been consumed continuously over a lengthy period which may extend to several weeks or months. Very definite advances have been made in our knowledge of plants responsible for hydrocyanic acid poisoning, particularly with regard to the role played by enzymes. This has been due largely to the work of Dr. Seddon, Director of Veterinary Research in New South Wales, and his colleagues. In the discussion that follows this work has been freely utilized, as has also the excellent work done in the veterinary field in South Africa and many experiment stations in the United States and elsewhere.

Among the several factors liable to influence the toxicity of poisonous plants two of the most important have been shown to be the season of the year when consumed and the area where grown. Seasonal variation in toxicity has now been closely studied in a number of troublesome plants and some interesting facts ascertained. Many of the most serious stock-poison plants of Southern Africa have been proved to be largely seasonal in toxicity. For instance, *Tribulus terrestris* L. the cause of " geeldikkop," a serious malady with sheep, is only toxic during some two to three months of the year.[27] *Pachystigma pygmaea* (Schltr.) Robyns, a plant common in some areas in South Africa, is also responsible for a sheep disease (" goussiekte ") and is known to vary a great deal in toxicity from season to season. In some seasons the disease is quite absent whereas in others mortality is high. It has been asserted by farmers in affected districts that the plant is poisonous when growing on red soil but innocuous on black, but investigation has not served to substantiate this belief.[37] Another sheep disease, " vermeersiekte," which is prevalent in some of the drier areas of South Africa, has been shown to be due to grazing on certain species of *Geigeria* among which are *G. passerinoides* Harv., *G. aspera* Harv., and *G. Zeyheri* Harv. These shrubs have to be consumed for several weeks before symptoms develop. It has been shown that they vary considerably in toxicity throughout the year. *Geigeria Zeyheri* for example is very toxic during midsummer (December-January),[7] but during the long period of February to September is innocuous, toxicity appearing again in about October. Certain species of *Cucumis*, e.g. *C. myriocarpus* Naud. and *C. africanus* L.f. have been found to be troublesome with sheep in the winter months but not in the summer in South Africa.

It has been found that in regions subject to a distinct or pronounced dry season that the incidence of plant-poisoning is often highest at that period when the dry season finishes and the first rains commence. This may be due simply to the fact that at this particular period there is a shortage of pasturage and harmful plants not normally eaten are consumed. In these regions it is often found that in seasons when the rains are late mortality is noticeably higher than in normal seasons. A factor which may, and often does, account for this is that the poisonous plants in question may be of a succulent or bulbous nature and not so dependent on the rains for the commencement of growth as are the grasses or other pasturage plants. The result is that the noxious species appear in leaf first and may be eaten in quantity by browsing animals, particularly as herbage is scarce at that period. Many of the poisonous plants in Southern Africa with bulbous or fleshy rootstocks are of this type, examples of which are species of *Urginea*, *Homeria* and *Moraea*. Such plants are not necessarily seasonal in toxicity, although poisoning from them is seasonal, for they are either dormant or insufficiently attractive to stock for a considerable portion of the year.

Among plants injurious to live-stock in the United States the evil effects of many are closely associated with the season of the year when grazed. Lupin poisoning for instance is associated with the autumn whereas " larkspur " (*Delphinium* spp.) and " death camas " (*Zygadenus* spp.) poisoning occurs mainly in the spring.

The stage of growth when consumed is an important factor with some species in determining whether they are likely to be toxic to animals. Some plants have been shown to be harmful only in the very young stage, others only when flowering or in fruit and others only when in a wilted condition. Plants poisonous only when wilted or in the young stage frequently owe their toxicity to the presence of cyanogenetic glucosides. Some plants, however, which are poisonous only when very young are not cyanogenetic. An interesting example is that afforded by certain species of *Xanthium*. For many years there were persistent reports in America that young cocklebur plants were the cause of death in young pigs. It was generally believed that cockleburs were harmful only in the injurious mechanical effect exerted by the fruits. Experiment subsequently proved, however, that these plants were poisonous in the germinating stage or during the development of the cotyledons. All classes of stock may be affected though a certain quantity has to be consumed for ill effects to occur. After the seedlings attain to a certain size they cease to be poisonous.[13] *Chenopodium atriplicinum* F. Muell. affords another instance of toxicity in the young stages only. This saltbush is a common herbage plant in parts of Australia and is frequently grazed by sheep with no ill effects. In some seasons, however, it has been strongly suspected as the cause of heavy mortality. Work in Australia has now shown[30] that when fairly large quantities are consumed the plant is liable to prove fatal, though only when the plant is in the young stage. *Echinopogon ovatus* Beauv. the " Noogoora Burr " is another Australian plant regarded as poisonous only in the young (two leaf) stage.

There appears to have been a marked divergence of opinion regarding the danger to live-stock of *Lotus australis* Andr., a plant widely distributed in Australia. Von Mueller regarded it as a deadly poison and stated " sheep are frequently killed in half an hour by it " whereas Maiden considered it a useful fodder and attributed deaths of cattle to their " feeding too greedily upon it." From material examined at the Imperial Institute[38] it was found that immature plants contained a cyanogenetic glucoside but fully developed plants contained nothing of a toxic character. This fact no doubt explains the contradictory reports that exist regarding the plant. Another species of *Lotus* that is known to be poisonous in the young stages but not when it has matured and seeds have formed—in which state it is reputed to be an excellent fodder—is *Lotus arabicus* L. This species is indigenous to Egypt and was the cause of heavy losses among military transport animals during the first Soudanese war.[38]

Dichapetalum cymosum (Hook.) Engl., the "giftblaar," is a fruitful source of poisoning in South Africa. Poisoning occurs chiefly during the period when young growth is made in the spring and autumn. The young growth is considerably more toxic than the old and as little as $\frac{3}{4}$ oz. of the leaves have been proved to be sufficient to cause the death of a sheep.[35] It is unusual among stock-poison plants for such small quantities to constitute a lethal dose. With the bulk of the important stock-poisoning plants of the world, i.e., those that actually cause heavy losses, comparatively large quantities have to be taken by an animal before harmful or fatal results occur. This is contrary to popular belief.

There is increasing evidence to show that plants which are toxic in one area may, although plentiful, be innocuous or but slightly toxic in another. The importance of *Tribulus terrestris* L. as the cause of a sheep disease in South Africa has already been referred to. This species is of wide distribution throughout the warmer regions of the world and as a weed is often a serious menace, yet it does not appear to be associated with stock-poisoning in any country except South Africa. There is ample testimony to the effect that the plant is eaten by domestic animals elsewhere. Among Australian plants there are several examples of this variation in toxicity attributed to locality. *Euphorbia Drummondi* Boiss., a common weed in many parts of New South Wales and constituting a considerable part of the herbage in some instances, has been found to be toxic in some localities but not in others.[29]

Diseases of sheep in Australia known commonly as " staggers " or " shivers " in which the animals develop a staggering or trembling condition on being exercised, often resulting in death, are caused by certain alien species that have become completely naturalized, viz :—*Stachys arvensis* L., *Malva parviflora* L., and *Lamium amplexicaule* L.[28] It is interesting to observe that these plants are natives of European countries but do not appear to have come under suspicion in regard to poisoning in their native habitat. There are also good reasons for suspecting that *Lantana crocea* Jacq. and *L. Camara* L. may vary in their degree of harmfulness to stock in different parts of Australia.

In India *Lathyrus sativus* L., a commonly cultivated pulse and food-plant of both man and beast, is well known to be the cause, after continued feeding, of a cerebro-spinal disease resulting in paralysis and known as " lathyrism." The seeds sometimes contaminate cereals or other pulses and have been suspected of injurious effects on animals in European countries fed with grain imported from India. It is reported that in 1891 Russian peasants of Saratov suffered from " lathyrism " as a result of large quantities of this pulse being imported and used in the preparation of bread owing to the shortage of wheat at that time. It is of interest in this connection that in Canada, where *Lathyrus sativus* is cultivated and the seeds used as food, toxic symptoms do not arise.[38]

The grass *Stipa Vaseyi* Scibn., known as " sleepy grass " in New Mexico, is of fairly wide distribution in the south western United States. In most areas the grass may be eaten without any ill effect but in some a peculiar narcotic effect on horses is produced, hence the name " sleepy grass." From feeding tests with horses it was shown that while profound slumber was produced it did not cause death. It is only in two particular areas that this peculiar effect is associated with the plant in spite of its comparatively wide range.[23] The well known succulent *Cotyledon orbiculata* L. or " pigs ear " is known to be frequently the cause of paralysis and sometimes death in fowls in South Africa and also death in sheep. It has been found that the toxicity of the plant varies in different areas and this variation is believed to be due to soil conditions.[36]

In poisonous plants the active principle generally exists in greater concentration in some particular organ though there are instances where a more or less even concentration exists throughout the whole plant. Of the large number of species with the active principle confined to, or located chiefly in the roots or rootstock, few are of any consequence to live-stock owing to the general inaccessibility of these organs. There are, however, occasions where stock are able to procure and devour the underground parts of such plants. It frequently happens that after storms or heavy rain, when the ground is soft, roots come away with the aerial parts on the first tug of the grazing animal and are consumed. The nature and texture of the soil and the toughness of the aerial parts are naturally factors in determining whether this will occur. Monocotyledonous plants, with a bulbous or fleshy rootstock are liable to behave in this way, and it is believed by some observers in the United States that the " death camas " (*Zygadenus* spp.) are often responsible for increased poisoning after rains in this manner. Another effect of heavy or torrential rain is that rootstocks along streams and watercourses are liable to be washed up or exposed. This is believed to be a common source of poisoning with species of *Cicuta*, particularly *Cicuta occidentalis*, the " poison parsnip " or " water hemlock," common in parts of the United States. It has been shown that the old rootstocks of this species are exceedingly poisonous throughout the year, though the young roots contain little or none of the poisonous principle (cicutoxin) which exudes from the cut root as a reddish or yellow liquid. The roots of this species appear to vary somewhat in toxicity according to locality, some from Nebraska having been found to be rather less poisonous than those from Nevada.[12] Leaves and stems of this plant were found to be poisonous when very young in the early spring but to be harmless in the later stages of growth in the summer and autumn. It is possible that some of these facts may hold for species of *Cicuta* harmful to stock in other countries.

Apart from the role played by the plant in cases of poisoning, the species or breed of animal and its age and condition at the time of ingestion are important factors in determining the effect produced on the animal, particularly where poisoning is due to prussic acid. Generally speaking young and immature animals are far more susceptible than the older ones.

The feeding habits peculiar to the species are sometimes responsible for one class of animal being entirely unaffected in a grazing area that may be dangerous to others. Thus sheep are more selective feeders than cattle or horses and often leave plants that are eaten indiscriminately with the other herbage by larger animals. For instance, species of *Ranunculus* when in flower—the flower being the most poisonous part—may poison cattle and horses but not sheep who are better able to avoid them. Sheep are notoriously erratic in their feeding habits and have been recorded as avoiding a plant one day which they may partake of copiously the next. Furthermore some sheep may be observed feeding freely on one species that other sheep in the same flock will avoid entirely. The individuality of stock in this respect has been well illustrated in the feeding tests that have been conducted in poison plant work. In work on *Matricaria nigellaefolia* DC., the cause of " push-sickness " or " staggers " in bovines in South Africa it was found that some sheep would eat the plant with avidity while others regarded it with absolute repugnance. With the latter ingestion could only be achieved by drenching.[1]

There may be great variation even among similar animals in their resistance to the effects of injurious plants. Among animals of the same breed, age, and state of health, etc., it has been found that the quantity of a given plant required to kill one animal may be four times as great as that required as a lethal dose for another. This has been found to be very noticeable in those plants with the cumulative type of toxicity. It is common knowledge that one species may be harmful or fatal to one class of animal but harmless to another. Other species may be harmful to more than one class of animal but produce different symptoms in those respective classes. The action of *Leucaena glauca* Bth. on domestic animals in the tropics affords an interesting example of a plant harmful though not fatal to some classes of animal but harmless to others.

This plant, known commonly as " wild tamarind," " jumbie " or " ipil-ipil," is a native of the American tropics but is now widely distributed in tropical and subtropical countries, being used in some regions as a soiling crop, fodder or hedge plant. In some countries, notably Fiji, it has spread to such an extent as to be regarded as a troublesome weed. The leaves and young shoots are readily eaten by most grazing animals and the plant affords nutritious hay.[39] It has been observed in the West Indies, Philippines[40] and elsewhere that horses feeding on the plant to any extent completely lose the hair from their manes and tails. The same is said to apply to mules and donkeys and in the case of pigs all the hair may fall from the body leaving them completely naked.[25] Apart from the loss of hair these animals are said to be unaffected in any other way and if transferred to grazing grounds where the plant does not occur the hair soon grows again. In the case of horses the new growth of hair of the mane and tail is reputed to be of coarser texture and different colour in some cases. Cattle, sheep and goats are able to consume the plant in quantity without perceptible effects and this depilatory action does not occur. In short the animals affected are non-ruminants whereas those unaffected are ruminants. It has been suggested that in ruminants the process of mixing the food with saliva and slowly digesting it may cause the poisonous principle to be neutralized and these animals therefore escape injury.

The " crinkly leaf poison," *Gastrolobium villosum* Bth., of Western Australia, is reputed to be poisonous at all periods of growth to horses, donkeys and ruminants, but to be eaten without ill-effects by wallabies.[17] Numerous other similar instances of immunity in wild animals are known.

The curious effect of certain plants in acting harmfully only on animals with unpigmented skin or those breeds without pigmentation is well-known in such plants as *Hypericum perforatum* L., St. John's Wort; *Fagopyrum sagittatum* Gilib., Buckwheat; *Medicago denticulata* Willd., Trefoil Burr; and certain species of *Trifolium*. The ingestion of such plants by stock in sufficient quantity leads to photosensitization with the development of dermatitis and later necrosis of the unpigmented surfaces of the body on exposure to sunlight. Those animals in which the exposed parts are pigmented are quite unaffected. Sunshine is necessary for the development of the malady and if dull weather accompanies or follows feeding of the plant, or if animals are kept out of sunshine, symptoms do not appear. Owing to the prevalence of St. John's Wort in parts of Australia and the trouble that is experienced with photosensitization in sheep due to it, considerable attention has been directed to the plant and to possible means of control. It was thought at one time that possibly only the mature plant was harmful but it has now been shown[34] that the plant may cause photosensitization even in the early stages of growth. This fact has removed the possibility of curtailing growth and development of the plant in its early stages by enforced grazing with sheep. Buckwheat has been known to cause photosensitization resulting in injury and loss in various classes of livestock in the United States.[19] It is probably not generally known that this extensively cultivated grain-crop and fodder is capable of serious poisoning under certain conditions. The plant is said to be most toxic when in flower. Among animals liable to be affected the more buckwheat consumed and the hotter the sun the greater will be the reaction. The head and ears are the parts most commonly affected. In extreme cases it is stated that digestive disturbance and brain affection may occur.

Before photosensitization can occur three conditions are necessary :—(i) the animal must possess an unpigmented or partly unpigmented skin, (ii) there must be sufficient intensity of sunlight, and (iii) a sufficient quantity of the plant in question must have been consumed.

Poisoning from the presence of compounds of hydrocyanic acid in plant tissue is of common occurrence and no doubt occurs more frequently in the *Gramineae* than in any other family. Species of *Sorghum* have been long known to be liable to contain dangerous amounts of such glucosides and to have been the cause of serious fatality among various classes of stock. It has been found in *Sorghum* and many other plants that danger exists chiefly in the early stages of growth, i.e., during the period of rapid formation of new tissue, or when the plants are in a wilted or damaged condition.

With most cyanogenetic plants a fairly large quantity of material must be consumed by the animal within a comparatively short time for death to occur. Death is then rapid, occurring within a few hours and in some instances within a very short space of time. When the material is ingested in small quantity only, the poison is rapidly eliminated by the system of the animal. Thus in the course of a day's grazing an animal may consume, in relatively small quantities and at intervals, material of a cyanogenetic plant, which, if taken at one feed, would be far more than sufficient to cause death. Many pasture and browse plants, regarded as excellent stock-feed when consumed under normal grazing conditions, i.e., eaten at intervals and grazed along with other plants, may cause death if eaten extensively in a short period of time. *Prunus demissa* A. Diet., the "western chokecherry," which is common in the mountain grazing areas of Nevada and elsewhere in the United States, is a plant of this class. In regions where the plant occurs poisoning in sheep is frequently found to occur soon after drinking from the mountain streams and has been attributed by shepherds to the water in the streams. Investigation, however, showed that such animals had previously eaten fatal doses of "chokecherry" but that the moisture in the stomach had been insufficient to liberate the poison until the animals drank from the stream. Poisoning from this plant is believed to be due primarily to dried and overgrazed conditions of feeding areas. It is stated that in late summer the plant loses its poisonous properties and may be consumed in quantity by sheep in the autumn without ill-effects.[11]

The question of the occurrence of compounds of hydrocyanic acid in ordinary pasture grasses has received close attention in recent years, especially in South Africa, where it has been suspected that the sudden unexpected deaths among stock on grass-veld that sometimes occur may be attributed to this cause. There it has been shown that some of the veld grasses never contain hydrocyanic acid, others develop it in small quantities only under special conditions or in certain stages of growth. Among several Bechuanaland grasses tested by Henrici[16] only one species, *Chloris petraea* Sw., was found to show any trace of a cyanogenetic substance in the fresh unwilted state. The same worker found that those veld grasses that develop a purplish red colouration during drought periods, characteristic of many South African grasses, contain little or no cyanogenetic compound, whereas those species with cyanogenetic substances never showed anthocyanin. The period when cyanogenetic compounds were most freely developed was before the rains in spring, or after the spring rains if wilting conditions should occur, and not during the summer drought periods as might be expected. Different species were found to vary considerably in regard to the stage of wilting at which the development of cyanogenetic substances occurred. These substances were found to disappear rapidly—within a few hours—after the recovery of the grass from the wilted to the normal state as the result of rain.

It is known that certain leguminous plants, normally nutritious fodder plants, may sometimes show evidence of hydrocyanic acid and that this is liable to considerable variation. Among these is the European species *Lotus corniculatus* L. Specimens from the same area have been shown to be completely devoid of any cyanogenetic substance in one year but to possess a considerable quantity the next.[2] Furthermore stunted drought forms exhibited a more abundant development of the substance than did forms of more luxuriant growth.

Many fodder plants which may be cyanogenetic, such as "Johnson grass," *Sorghum halepense* Pers., and other species of *Sorghum*, are commonly regarded as quite innocuous when dried or made into hay, the cyanogenetic substance present being often of an unstable nature and free hydrocyanic acid rapidly disappearing on drying. It has now been shown by Seddon and others[33] that the cyanogenetic glucosides causing prussic acid poisoning vary considerably in stability. In some plants they may be quite stable, in others relatively unstable. In the case of stable glucosides the presence of the requisite enzyme is necessary for the splitting of the glucoside before liberation of hydrocyanic acid is possible. With animals fed exclusively on a dried cyanogenetic plant the necessary enzyme may not be present, or present in insufficient quantity, to cause poisoning. However, it is now believed that very frequently the necessary enzyme may already exist in sufficient quantity in the rumen of the animal as a result of previous feeding on fresh plants that contain it. If other plants containing the necessary enzyme be ingested together with, or soon after, the cyanogenetic plant the necessary enzyme is supplied and poisoning may occur.

Variation in cyanogenesis has now been shown to be a feature of many Australian plants dangerous to live-stock.[9] One of the best examples is probably that afforded by *Euphorbia Drummondi* Boiss. This plant, a common weed in some parts of Australia, has long been suspected among some stock-owners as the cause of death in stock whereas others have always contended that the plant is harmless. Systematic collection and examination of material of the plant has now shown why such diversity of opinion regarding its toxicity should exist. Out of a total of one hundred and thirteen specimens examined from various localities in New South Wales only eleven were found to contain a cyanogenetic substance.[9] Among these it was found that in some the glucoside was accompanied by sufficient enzyme to cause total hydrolysis, while others—procured later in the season—were found to be deficient in enzyme and could only develop their total amount of hydrocyanic acid when additional enzyme from an outside source had been added. Certain species of *Acacia* occurring in Australia are also known to be cyanogenetic but to be devoid or nearly devoid of the requisite enzyme for liberation of prussic acid. Among other dangerous cyanogenetic plants of Australia are *Cynodon incompletus* Nees, " blue couch " ; *Heterodendrum oleifolium* Desf. " rosewood " ; *Lotus australis* Andr. " birdsfoot trefoil " ; *Silybum Marianum* Gaertn. " variegated thistle " (possibly) ; and *Chenopodium carinatum* R. Br.[29] The last mentioned has been found to be cyanogenetic in some localities in New South Wales but not in others.[31]

In an investigation carried out on the amount of hydrocyanic acid in *Sorghum* spp., Sudan Grass, *Sorghum sudanense* Stapf, and various *Sorghum*—Sudan Grass hybrids[10] it was found that a very wide range in the amount of hydrocyanic acid among different varieties and hybrids occurred. All were found to contain a certain amount up to a hundred and thirty days from sowing, the actual amount varying from 2–331 millegrams hydrocyanic acid per 100 grams of the fresh plant.

The importance of saponins in plants as the cause of several obscure stock diseases in many parts of the world is now well recognised. In the majority of cases it is only by the prolonged ingestion of these saponin containing plants that the injurious results are caused. It has been shown[8] that the presence of certain other substances in the plant, such as tannin, may completely counteract any ill effects from the saponin, even though the saponin may be present in quite considerable quantity. The following species are listed by Ewart[8] as being among those plants known to cause specific diseases of livestock owing to the presence of saponins :—*Atalaya hemiglauca* F. Muell. ; causes " walkabout " disease of horses in parts of Australia : *Solidago rigida* L. ; affects horses in North America : *Solidago canadensis* L. ; affects livestock generally in North America : *Aster Parryi* A. Gray ; causes " grub in the head " disease of sheep in N. America : *Senecio Jacobaea* L. ; causes " Winton " disease of horses and sheep in New Zealand : *Senecio latifolius* DC. ; causes " Molteno " disease of horses and cattle in South Africa : *Senecio* sp. ? ; causes " dunsiekte " disease of horses in South Africa.

Ewart states, " Little attention has been paid to the effect of the prolonged ingestion of plants containing saponin upon grazing stock, but it is quite possible that certain obscure diseases of stock, and more particularly of horses, in various parts of the world may be due to this cause."

Saponins are known to occur freely among flowering plants and to be very prevalent in some families. The amount varies considerably among different plants and in the different organs of the same plant, and may vary in the same plant according to season and stage of growth. Usually seeds and fruits contain most saponin when mature. The percentage in the leaves also usually increases as the leaves mature but decreases on further ageing. In some plants saponin is located chiefly in the root and in others in the bark. Under such circumstances it is hardly likely to be of concern to grazing animals. In a normal healthy animal the amount of saponin absorbed through the alimentary canal when the animal first has access to a harmful saponin-containing plant is small. Continued ingestion, however, is stated to lead to inflammation of the alimentary canal resulting in an increase in the amount of saponin absorbed from subsequent feeding.

In Australia " walkabout " disease of horses, due to the " whitewood," *Atalaya hemiglauca* F. Muell., is stated to occur only north of the nineteenth parallel whereas the tree occurs abundantly down to the twenty-fifth parallel.[8] In experiments made with the material from the more northerly areas and from the southern areas of distribution it has been found that the former owes its toxicity to the presence of a considerably greater quantity of saponin. From tests conducted on snails it would appear that the saponin of plants from the more northerly areas is of a more toxic type. The suggestion has been made that " the plant may contain two or more saponins of varying toxicity in variable proportions."[8] Furthermore, it has been found that plants from areas where the disease does not occur have shown evidence of a higher tannin content. As tannin is known to counteract the effects of saponin in some instances it is possible this variable tannin content may also be a factor in determining the presence or absence of " walkabout " disease. It has been found that even in northerly localities the degree of toxicity of the plant may vary somewhat from one area to another. With regard to the absence of " walkabout " disease from the southern areas of distribution of *Atalaya hemiglauca*, Ewart states :—" Many other cases are known in which a poisonous plant becomes harmless near its southern or northern temperature limit owing to its developing little or none of its poisonous principle under less favourable temperature conditions, and this effect will be increased if the plant under these conditions produces more of a protective substance such as tannin, or forms a variety of the poisonous principle which is more readily decomposed in the alimentary canal."

" Winton " disease of horses and sheep in New Zealand has been produced artificially by feeding ragwort, *Senecio Jacobaea* L., over a prolonged period, the plant having been shown to contain 4–5 per cent. of a water soluble haemolytic saponin. Other species of *Senecio* are associated with stock diseases in other parts of the world, e.g., " Molteno " disease of horses and cattle in parts of South Africa and " Pictou " disease of Nova Scotia. In some instances poisonous principles other than saponin have been isolated and regarded as playing a part in poisoning. It is considered that they may act also as intestinal irritants increasing the permeability of the alimentary canal and raising the effective toxicity of the plant when eaten.[8]

There are many instances where it is known that deficiencies in the soil of certain minerals results in similar deficiencies in the plants growing in these soils and that these in turn may be responsible for maladies in grazing stock, such maladies being commonly known as " deficiency diseases." It is therefore possible that a plant or community of plants may afford a wholesome and adequately balanced stock-food in one area while in another it may, in the course of time, be responsible for a deficiency disease owing to the shortage of a certain mineral under altered soil conditions. Such plants are therefore to be judged as wholesome or unwholesome animal foods according to their chemical composition in any one habitat and it is the soil conditions, in being responsible for the variation in composition of the plant tissue, that ultimately govern the presence or absence of these deficiency diseases. These plants are harmful owing to the absence of a constituent necessary for the health of the animal, rather than to the presence of any toxic substance as is usually the case with plants harmful to stock. The lack in the pasturage of any one of the essential minerals may cause only a mild disorder in the animal such as unthriftiness or lack of condition if of mild degree, but if of greater intensity it may lead to more grave disorders and to the death of the animal.

In addition to mineral deficiencies the lack of certain organic constituents, e.g., vitamines and amino-acids, are known to cause nutritional disturbances.[32] Under natural grazing conditions with live-stock, however, it is the mineral deficiencies that are responsible for the more serious types of deficiency disease throughout the world. The insufficiency of such minerals as phosphorus, calcium, iron, and iodine in animal nutrition has been closely studied and their absence in requisite quantity in pasturage has been shown to cause some of the worst forms of deficiency disease in different areas.[26] As a result of these studies interesting observations have been recorded regarding the role played by the plant and the extent to which the same species may vary in certain mineral content under different conditions of soil, climate, or season.

Phosphorus deficiency in the pasturage is particularly acute in parts of Australia and southern Africa. In South Africa this deficiency is especially widespread and has been proved to be responsible for much of the unthriftiness of stock and for some of the worst maladies of live-stock—notably " lamsiekte " and " stifjsiekte "—which cause heavy mortality. The analyses of some of the commoner veld grasses in South Africa have shown that in many instances they contain only about one-sixth the amount of phosphorus that is usually contained in common European grasses. It has been demonstrated by Henrici[15] that there is remarkable variation in phosphorus content according to season. It is highest with the advent of the spring rains while the grasses are in early stages of growth. The phosphorus content remains at this relatively high level only for a short period in most areas, whereupon it decreases and reaches its lowest level at the end of the summer. In one area the percentage of phosphoric oxide was found to be as low as ·04 at this period, as against ·65 for the high early spring figure in the same area. The same worker has demonstrated that periods of drought, which are of frequent occurrence in South Africa, cause a diminution of phosphorus in the leaves of veld grasses and that some of the phosphorus passes back into the roots and eventually, it is thought, back to the soil. In studying the phosphorus and calcium content of veld grasses on the Natal coast and southern Zululand along with the available phosphorus and calcium in their corresponding soils, the same author found a relation to exist for phosphorus but not for calcium and remarks, " It appears that most of the investigated grasses are poor in phosphorus, calcium and nitrogen, but rich in sodium chloride. The two grasses which were found nearly everywhere, *Digitaria natalensis* and *Themeda triandra* (coast form), have to be considered as poor grasses. Some of the grasses like *Panicum maximum* and *Dactyloctenium aegyptiacum* respond to a better soil and should also benefit by fertilization but others do not show any variation analytically in response to change of soil. Several small *Digitaria* species proved to be good grasses from the point of phosphorus content." [14]

It has been found that European grasses growing in Australia have a lower average phosphorus content than when growing in Europe, but are nevertheless markedly richer in phosphorus (when grown in Australia) than are the indigenous Australian grasses.[18]

Insufficient iron in the pasturage is the cause in New Zealand of the disease of stock known as " bush-sickness." It is believed that similar diseases in other parts of the world are caused by the same mineral deficiency, among which are " Nakuruitis " (Kenya), " pining " (Scotland), " coast-disease " (Tasmania) and " salt-lick " (Florida).[5] In New Zealand the iron in the soil is present largely in the form of silicate of iron which is insoluble and more or less unavailable to plants. Excess of manganese in the soil is also suggested as a factor which limits the assimilation of iron. In " bush-sickness " investigations in New Zealand it has been shown[4] that the amount of iron in the pasturage varies with the season and the age of the plant or part of the plant in question. In contrast to phosphorus in South African veld grasses it is found to be least in those parts of the plant developed in the spring and greatest in the tissue of late summer and autumn. New Zealand grown cocksfoot (*Dactylis glomerata* L.) and other grasses were found to possess a lower iron content in the " bush-sick " areas than elsewhere. Among introduced clovers, which constitute the bulk of the grazing in some areas, this difference was even more marked and plants from the " bush-sick " areas were found to contain considerably less iron than those from " healthy " pastures. Even in " healthy " pastures in New Zealand the figures for iron have been found to be persistently lower than those for the same clover grown in Europe.

The disease known as " Nakuruitis " which occurs in the neighbourhood of Nakuru in Kenya is of rather special interest. Orr[26] describes the disease and its occurrence as follows :—" Working oxen, after being in the area from four to six months, begin to suffer from anaemia, emaciation, running at the eyes," and in the advanced stages loss of power and co-ordination of the limbs. If the animals be removed to the Solai Plain, a few miles off, they recover in one to three months, and can be brought back to work within the area for a further period. The condition resembles " bush-sickness " in New Zealand. A remarkable feature of this disease is its disappearance within the last ten years from two areas, viz. :—(*a*) land in the immediate vicinity of the town of Nakuru, and (*b*) an area used as a remount camp during the war. In both of these areas there has been a large amount of material brought in and left in the soil. It looks as if the deficiency in the soil, which was the cause of the disease, has been made good, at least to the extent which enables oxen to graze for a year or longer without showing signs of the disease. In some recent tests which have been carried out it has been found that animals allowed to lick ad lib. a mixture of equal parts of common salt and ferric oxide remain healthy, while control animals on the same pasture, but without the salt lick, develop the typical symptoms of the disease."

A common symptom in grazing animals of mineral deficiency in the pasturage is the development of depraved appetite. In the case of phosphorus this leads to the chewing of old bones and carcase debris often resulting in carrion poisoning. " Lamsiekte " in South Africa has been shown to be directly due to the toxin secreted by an organism infecting carcase debris which enters the animal's system through this habit of bone-chewing. It has been observed that in areas where a deficiency in common salt exists and salt-licks are generally provided that animals, particularly sheep, are liable to acquire a depraved appetite for many toxic plants if they do not procure sufficient salt.[6]

Depraved appetite may develop in stock through causes other than mineral deficiency. In areas in the United States where " loco " poisoning occurs (due to certain species of *Oxytropis* and *Astragalus*), which is a malady that does not become manifest until prolonged feeding on the plant has taken place, it has been observed[22] that some animals acquire such a liking for the plant that they refuse to eat anything else right up to the time of death. Regarding the somewhat peculiar symptoms of this disease Marsh[22] states :—" Horses formerly quite gentle become uncontrollable and shy violently at imaginary objects or leap high over some slight obstruction. Generally speaking a locoed horse can be neither led nor backed, and when put in motion cannot easily be stopped or turned, but may continue until it runs against a fence or other obstruction." It is stated to be almost impossible to drive in any one direction a flock of sheep that have been " locoed."

The horsetail (*Equisetum* sp.) is another plant for which horses are said sometimes to acquire a depraved appetite in America.

From the facts outlined in this article it is apparent the term " poisonous plant," when used in connection with the pasturage or food-plants of grazing animals, has come to assume a wide significance. It is now commonly used not only for those species that are acutely poisonous but also for plants that in any way disturb the health of stock. There can be little doubt that those plants that must be consumed in quantity over a long period before harmful results to the animal appear, which, of course, includes those causing deficiency diseases, are of far greater moment to the live-stock industry throughout the world than are the more rapid-acting drastically poisonous species.

REFERENCES.

1. ANDREWS, W. H., in 9th & 10th Rpt. Dir. Vet. Educ. & Res., Agric. Dept., S. Afr., 123–220 (1924).
2. ARMSTRONG, H. E., ARMSTRONG, E. F., & HORTON, E. in Proc. Roy. Soc. Lond., **84**, 471–484 (1911–12).
3. ASTON, B. C., in N.Z. Jour. Agric., **16**, 6, 324–328 (1918).
4. ASTON, B. C., in N.Z. Jour. Agric., **29**, 84–91 (1924).
5. ASTON, B. C., in N.Z. Jour. Agric., **44**, 171–176 (1932).
6. BEATH, O. A., Univ. of Wyoming, Agric. Exp. Stn., Bull. No. 126 (1921).
7. DU TOIT, P. J., in 13th & 14th Rpt. Dir. Vet. Educ. & Res., Agric. Dept., S. Af., 109–153 (1928).
8. EWART, A. J., Coun. Sci. & Ind. Res., Australia, Bull. No. 50 (1931).
9. FINNEMORE, H. & COX, C. B., in Jour. & Procs. Roy. Soc. N.S.W., **62**, 369–378 (1929).
10. FINNEMORE, H. & COX, C. B., in Jour. & Procs. Roy. Soc. N.S.W., **65**, 145–152 (1932).
11. FLEMING, C. E., & DILL, R., Univ. of Nevada, Agric. Exp. Stn., Bull. No. 110 (1928).
12. FLEMING, C. E., & PETERSON, N. F., Univ. of Nevada, Agric. Exp. Stn., Bull. No. 100 (1920).
13. GATES, F. C., Kansas State College Agric. Exp. Stn., Manhattan, Tech. Bull. No. 25 (1930).
14. HENRICI, M., Agric. Dept., S. Af., Sci. Bull. No. 115 (1932).
15. HENRICI, M., in 13th & 14th Rpts. Dir. Vet. Educ. & Res., Agric. Dept., S. Af., 1077–1208 (1928).
16. HENRICI, M., in 11th & 12th Rpts. Dir. Vet. Educ. & Res., Agric. Dept., S. Af., 495–498, (1926).
17. HERBERT, D. A., Dept. Agric., W. Australia, Bull. No. 95 (1921).
18. KINCAID, H., in Proc. Roy. Soc. Victoria, **23**, n.s., 368–391 (1911).
19. LAWRENCE, W. E., Oregon Agric. Coll. Sta. Bull. No. 187 (1922).
20. LONG, H. C., Plants Poisonous to Live-Stock (1917).
21. MARSH, C. D., U.S. Dept. Agric., Farmers' Bull. No. 720 (1916).
22. MARSH, C. D., U.S. Dept. Agric., Dept. Bull. No. 1245 (1924).
23. MARSH, C. D., & CLAWSON, A. B., U.S. Dept. Agric., Tech. Bull. No. 114 (1929).
24. METTAM, R. W. M., in Kenya Agric. Dept., Ann. Rpt. for 1929, 377–417.

25. Morris, D., in Rpt. Br. Assn. Adv. Sci. for 1896, 1017–1018.
26. Orr, J. B., Minerals in Pastures (1929).
27. Quin, J. I., in 15th Rpt. Dir. Vet. Educ. & Res., Agric. Dept., S. Af., 765–767 (1929).
28. Seddon, H. R., in Agric. Gaz. N.S.W., **36,** 355–358 (1925).
29. Seddon, H. R., in Agric. Gaz. N.S.W., **39,** 777–782 (1928).
30. Seddon, H. R., in Agric. Gaz. N.S.W., **42,** 865–866 (1931).
31. Seddon, H. R., in Agric. Gaz. N.S.W., **43,** 763–764 (1932).
32. Seddon, H. R., in Rpt. 12th Meeting Austr. and N.Z. Assn. Adv. Sci., Brisbane Meeting, May–June 1930, 409–428.
33. Seddon, H. R., & King, R. O. C., in Jour. Coun. Sci. & Ind. Res. Australia, **3,** 1, 14–24 (1930).
34. Seddon, H. R. & Balschner, H. G., in N.S.W. Dept. Agric., Vet. Res. Rpt. No. 5, 103–105, (1929).
35. Steyn, D. G., in 13th & 14th Rpt. Dir. Vet. Educ. & Res., Agric. Dept., S. Af., 185–194 (1928).
36. Steyn, D. G., in 15th Rpt. Dir. Vet. Educ. & Res., Agric. Dept., S.Af., 791 (1929).
37. Theiler, A., du Toit, P. J., & Mitchell, D. T., in 9th & 10th Rpt. Dir. Vet. Educ. & Res., Agric. Dept., S. Af., 9–105 (1924).
38. The Bull. Imp. Institute, **1,** 12–18 (1903).
39. The Trop. Agriculturist, **72,** 279–280 (1929).
40. Villegas, V., in The Philippine Agriculturalist, **11,** 151–152 (1922).
41. Watt, J. M., & Breyer-Brandwijk, M. G., The Medicinal & Poisonous Plants of Southern Africa (1932).

XXXIX—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA : XV.*

T. A. Sprague and N. Y. Sandwith.

The Genus Ceratophytum.

One of the chief difficulties encountered in naming Bignoniaceae is the fact that in many cases both flower and fruit are required in order to determine the genus. Hence it has often happened that the same species has been described separately under two or more genera. In 1916 Urban based a new species, *Anemopaegma tobagense*, on flowering material (Broadway 3493) from the island of Tobago. He gave no indication of its position within the genus *Anemopaegma*, but described the corolla-tube as "pulverulento-tomentosulus," and the ovary as "oblongo-lineare," two characters which actually are exceptional in the genus. In 1921 *Anemopaegma tobagense* was found by Dr. N. L. Britton (no. 2834) in Trinidad, also in the flowering condition, and in 1925 was re-discovered in Tobago by Mr. R. O. Williams (Herb. Trin. 11,165), this time in the fruiting state.

In 1928 Dr. H. Pittier described a remarkable new genus of Bignoniaceae which he named *Ceratophytum* in allusion to the horn-shaped woody capsules. This included two species, both natives of northern Venezuela. As Dr. Pittier observed, *Ceratophytum* is clearly related to *Distictella* (*Distictis* Bur., non Mart.) ; it differs in having gland-fields below the nodes, an abbreviated subcorymbose inflorescence, a lepidote calyx, and elongated tapering fruits. The

---

*Continued from *K.B.* 1932, 406.

two species are woody climbers with trifoliolate leaves in which the terminal leaflet may be replaced by a trifurcate tendril.

Material of the fruiting specimen of *Anemopaegma tobagense* collected by Mr. Williams in Tobago was subsequently received at Kew, when it was recognized that it belonged to the genus *Ceratophytum*. In the absence of flowers, however, it could not be identified with either of Dr. Pittier's species. The receipt from Mr. Broadway of flowering and fruiting material (no. 9060) of *A. tobagense* collected near the type-locality now enables us to correlate the Tobago species with the Venezuelan ones.

The chief differences between *Ceratophytum capricorne* Pittier and *C. brachycarpum* Pittier seem to be as follows :—

C. capricorne : Leaflets more or less obovate. Anther thecae about 3 mm. long. Capsule about 40 cm. long, non-punctate. Seeds 4·5–5 cm. broad.

C. brachycarpum : Leaflets ovate-elliptic. Anther thecae 4 mm. long. Capsule 16–24 cm. long, lepidote-punctate. Seeds about 3·3 cm. broad.

Anemopaegma tobagense has the following corresponding characters : Leaflets ovate-elliptic. Anther thecae 4·5 mm. long. Capsule 22–27 cm. long, lepidote-punctate. Seeds 3·3–4 cm. broad.

As will be seen, none of the characters mentioned serves to distinguish *A. tobagense* from *C. brachycarpum*, and we accordingly unite these two species.

The synonymy and geographical distribution of the two species of *Ceratophytum* are given below.

Ceratophytum *Pittier* in Journ. Wash. Acad. Sc. xviii. 62 (1928).

C. capricorne *Pittier*, l.c. 63.

VENEZUELA. Federal District : between Caracas and La Guaira, *Pittier* 11527 ! Without locality, *Fendler* 2359 !

C. tobagense (*Urb.*) *Sprague et Sandwith*, comb. nov.—*Anemopaegma tobagense* Urb. in Fedde, Repert. xiv. 311 (1916). *Ceratophytum brachycarpum* Pittier in Journ. Wash. Acad. Sc. xviii. 65 (1928).

VENEZUELA. Aragua : near Garabato, *Pittier* 11805 ! Carabobo : La Sanguijuela, *Pittier* 9153. Guárico : near El Sombrero, *Pittier* 12,366. Lara : near Sarare, *Pittier* 11,754.

TRINIDAD. Near Rio Grande, *Britton* 2834 !

TOBAGO. In Scoby's land north-west of Curator's house, *Broadway* 3493. Scarborough (near the type-locality of no. 3493), *Broadway* 9060 ! Stoer Bay, *R. O. Williams in Herb. Trin.* 11,165 !

BRITISH GUIANA or SURINAM. Cabalebo Falls, Corentyne River, *im Thurn* !

According to Pittier, the corolla of *C. capricorne* is white with a yellow throat, and that of *C. brachycarpum* is entirely white. In Trinidad and Tobago, however, the corolla of *C. tobagense* is white with a yellow throat, according to Broadway, Britton and Williams. We do not attach much importance to this difference in colour.

The capsule valves of *C. capricorne* are described by Pittier as longitudinally sulcate and carinate in the middle, and those of *C. brachycarpum* as slightly channelled. This character may perhaps depend on the age of the fruit, immature capsules of *C. tobagense* from Tobago (*Broadway* 9060) having a strong median rib on each valve, whereas an old valve (*Williams* 11,165) is definitely channelled.

XL—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA: XVI.

N. Y. Sandwith.

New Species and First Records from British Guiana, mainly collected by Mr. T. A. W. Davis.

The species dealt with below were mainly collected on a very important expedition to the interior of British Guiana which was made by Mr. T. A. W. Davis, Assistant Conservator of Forests, between June and November, 1931. Mr. Davis made numerous camps in the savannah and forest country of the Rupununi and Takutu Rivers and their tributaries, and was able to explore the base and slopes of the Kanaku Mountains which were made famous by the Schomburgks in their accounts of *Strychnos toxifera* and the Cock-of-the-Rock. He also spent five days on Mount Kusad, an isolated forest-clad range rising out of the savannahs on the south side of the Kanaku range.

As is well known, the Schomburgks collected extensively in this district, but few experienced botanists have been there since 1845, although some river-bank collections were made in recent years by Mr. J. S. de la Cruz. Mr. Davis, whose main object was to tour the balata forests of the Rupununi District, was able to leave the river-banks and to penetrate into the forests, where he cut down examples of many of the larger trees, especially of those which seemed to be of ecological importance. The herbarium material is of the very best quality, and its examination shows that Mr. Davis has discovered some fine new species of large trees, has re-collected many of the Schomburgks' species, and has also made numerous first records for the Colony. Some of the latter are of trees which had been collected before by Ule in similar country on the neighbouring Rio Branco. More interesting is the appearance in British Guiana of several species which have recently been described by Dr. Ducke from the forests of northern tributaries of the Amazons; good examples of these are *Hirtella obidensis* Ducke, *Alseis longifolia* Ducke and the remarkable new monotypic genus *Lepidocordia* Ducke, species collected previously only on the lower Rio Trombetas and Rio Branco de Obidos. In this connexion, Mr. Davis has made some interesting observations in an account of his expedition which, it is hoped, will be published later when all the species of ecological importance have been identified. He infers from them that the flora of the forest area of this region is more closely allied to that of the Amazonian forests than to that of the Guiana rain-forest lying to the north-east; and he thinks it probable that these forests represent a pre-climax of the Amazons rain-forest.

A few other notes of interest are added, and all species which appear from the evidence of the Kew Herbarium to be first records for the Colony are marked with an asterisk. The descriptions of two new Pipers, which were collected by the Oxford Expedition in 1929, have been kindly contributed by Dr. Trelease and are inserted at the end of this paper.

VIOLACEAE.

Rinorea endotricha *Sandwith*, sp. nov.; *R. Martini* (Turcz.) Blake affinis, petiolis glabris, sepalis parce tantum pubescentibus vel glabris, antheris apice exappendiculatis differt; a *R. sylvatica* (Seem.) Kze. foliis ramulis petiolisque glabris, sepalis fere glabris vel glabris, petalis extra glabris sed intus pilosulis, filamentis glanduliferis longe recedit.

Arbor humilis, ramulis summis tenuibus glabris (raro parcissime hirtellis) fusco-rubris leviter costatis, internodiis summis 1·5–6 cm. longis. *Folia* ovata usque lanceolata, apice longe (nonnunquam usque 2 cm.) acuminata, basi obliqua margine superiore in petiolum superius rotundata et saepius etiam cordata inferiore rotundata, 9–12·5 cm. longa, 3·2–5 cm. lata, chartacea, glabra, subtus subglaucescentia, marginibus obscure crenulato-serratis, nervis primariis utroque costae latere 12–15, his cum rete venularum supra tenuibus subtus valde prominentibus rete intricatissimo; petiolus brevissimus, 2–3 mm. longus. *Stipulae* in ramulis novellis saltem persistentes, subulatae, 4–5 mm. longae, costato-striatae, parce pubescentes vel subglabrae. *Racemi* breves, 2–4 cm. longi, densiflori, satis dense hirtelli; bracteae sepalis similes, lanceolatae, acutissimae, ad 3·5 mm. longae, valde costato-striatae, pubescentes usque subglabrae; bracteolae similes sed breviores, 2–2·5 cm. longae; pedicelli hirtelli, 2–4 mm. longi. *Flores* albi. *Sepala* ovato-lanceolata, acutissima, 4–4·5 mm. longa, ad 2 mm. lata, extra valde costato-striata marginibus membranaceis ciliatis sparse praesertim superne pubescentia demum subglabra vel glabra, intus glabra. *Petala* sepala paulum tantum excedentia, oblonga vel obovato-oblonga, obtusa vel subacuta, 6 mm. longa, circiter 2·3 mm. lata, apice patula, conspicue ciliata, extra glabra, intus inferne glabra sed dimidio superiore conspicue pilosula. *Stamina* circiter 4 mm. longa; filamenta 0·5–0·7 mm. longa, circiter 0·4 mm. lata; glandula filamentum excedens, 0·8 mm. longa, parte libera brevi apice obtuso rotundato; antherae lanceolato-oblongae, 1·8 mm. longae, 0·6 mm. latae, apice nudae exappendiculatae; squamae connectivi lanceolatae, ad 3·3 mm. longae, 1–1·2 mm. latae, integrae. *Ovarium* globosum, 1·2 mm. longum atque diametro, flavescenti-pilosum; stylus rectus, 3–3·5 mm. longus, basi pilosa excepta glaber; placentae 3–4, 2-ovulatae. *Fructus* ignotus.

BRITISH GUIANA. Simuni Creek, Rupununi River, August 1931, *Davis* in *Forest Department* no. 2127 : an undergrowth tree, growing in miscellaneous forest on top of a low hill at about 350 ft., very common ; flowers pure white.

The most remarkable characteristic of this species is certainly the indumentum of the inner surface of the petals, which is not usual in American species of *Rinorea*. But, apart from this feature, the long striate bracts, bracteoles and sepals, and the short racemes, give this species a facies which is shared, in the Kew Herbarium, by *R. sylvatica* alone. The latter plant, however, differs widely in important characters, as may be seen from the diagnostic paragraph given above. *R. Martini*, which was collected in Cayenne, is not represented at Kew, but is apparently quite distinct from the present species, possibly even more distinct than has been assumed here ; for, if Blake was right (see Contr. U. S. Nat. Herb. xx. 507) in believing that Oudemans' figure and description of *Alsodeia flavescens* probably represent the same plant as *R. Martini*, then *R. Martini* has sepals only 2 mm. long and petals 2·5 mm. long (see Arch. Néerl. ii. 195, pl. iv.). There is, however, at least one discrepancy between Turczaninov's and Oudemans' descriptions, the former describing the leaves as glabrous, whereas the latter writes of them as pubescent above and hirtellous beneath on the nerves. Turczaninov unfortunately omitted to give any dimensions of the floral parts of his species.

***Rinorea Lindeniana** (*Tul.*) *Kze.*—*R. micrantha* Ule.

Right bank of Rupununi River a few miles above mouth of Maparri Creek, fl. Sept., *Davis* in *F.D.* 2169 : a small undergrowth tree in rather low miscellaneous forest ; fl. creamy-white.

Distr. Trinidad, Northern South America. First record from Guiana.

This agrees excellently with Ule's syntype of *R. micrantha* from the Rio Jurua, Brazil. Both specimens differ from Kew material of *R. Lindeniana* in the smaller sepals which are not conspicuously ribbed, but the two species are united, no doubt with justification, by Melchior in Notizbl. Bot. Gart. Berlin, x. 544–6 (1929).

FLACOURTIACEAE.

***Carpotroche surinamensis** *Uitt.*, e descr.

Simuni Creek, Rupununi River, c. 350 ft., Aug., *Davis* in *F.D.* 2111 : small tree of understory and undergrowth in high miscellaneous forest ; fl. white (♂). *Ibid.* (♀), with yellow fruit and pink seeds, *F.D.* 2112. Right bank of Rupununi River a few miles above mouth of Maparri Creek, c. 400 ft., fl. Sept., *Davis* in *F.D.* 2170 : tree of undergrowth and occasionally up to 60 ft. high, in rather low miscellaneous forest near bank of a creek ; fl. ♂ only, white, with deep yellow stamens. This has narrower leaves than 2111 and 2112.

Distr. Surinam.

***Casearia Rusbyana** *Briq.*

Demerara River, 1896, *Jenman* 6892. Camaria Road, Cuyuni River, fl. Dec. 1931, *Lockie* in *F.D.* 2020 : a small tree with scented flowers, used as an emetic and for fuel.

Distr. Eastern Venezuela (Lower Orinoco).

***Banara guianensis** *Aubl.*

Camaria Road, Cuyuni River, fl. Feb., *Davis* in *F.D.* 1015 : small shrub about 20 ft. high in low second growth ; fl. yellow.

Distr. Panama to French Guiana. Trinidad. Widely spread in Brazil.

VOCHYSIACEAE.

Vochysia crassifolia *Warm.*

Southern side of Kanaku Mts. ; right bank of Rupununi River near Sand Creek, fl. Oct., *Davis* in *F.D.* 2246 : a small tree about 20 ft. high, growing beside a small creek in small upland savannah at about 1000 ft. ; fl. yellow.

Vernacular name (Arawak), " Iteballi."

Distr. British Guiana, Brazil (Rio Branco, *Ule*).

STERCULIACEAE.

***Guazuma ulmifolia** *Lam.*

N. side of Kanaku Mts., about 10 miles east of Takutu River, c. 450 ft., Oct., *Davis* in *F.D.* 2204 : tree about 50 ft. high and 8 in. diam., in second growth at foot of the mountains ; fl. yellow with deep red bases to the petals.

Vernacular name (Arawak), " Wonam."

Distr. Tropical America.

ERYTHROXYLACEAE.

Erythroxylum vernicosum *O. E. Schulz.*

Yupukarri, Rupununi River, c. 400 ft., Sept., *Davis* in *F.D.* 2175 : undergrowth shrub or small tree, in patch of savannah forest ; fl. white.

Distr. British Guiana and Rio Branco, Brazil.

Approaching the var. *oreophilum* O. E. Schulz in Notizbl. Bot. Gart. Berlin, vi. 142 (1914), which was collected by Ule on the Rio Branco, but the leaves are cuneate or rounded at the base, not emarginate.

MALPIGHIACEAE.

***Diplopterys includens** (*Bth.*) *Ndz.*—*Tetrapterys ? includens* Bth.

Summit of Tiger Hill, Arawau-Yarakita Portage, N.W. District, May 1929, *Martyn* 70 : liane with very striking yellow flowers. Near Matope Falls, Cuyuni River, Feb. 1931, *Martyn* 245 : a common bush-rope in morabukea and mixed forest, used as an aphrodisiac and called " Devil-doer " (cf. *Strychnos* spp.).

Distr. French Guiana. Brazil, Venezuela and Peru, if *D. involuta* (Turcz.) Ndz. is considered conspecific.

RUTACEAE.

***Rauia Ulei** *Krause.*

Kartabo Road, fl. Feb., *Davis* in *F.D.* 1021 : undergrowth shrub on hill slope in mixed forest, on brown sandy loam ; fl. white.

Distr. Brazil (Rio Acre, *Ule* 9495 !).

OCHNACEAE.

Ouratea superba *Engl.*

Apoteri, Rupununi River, c. 300 ft., fl. June, *Davis* in *F.D.* 2061 : tall shrub growing at edge of a backwater, deeply inundated during the rainy season ; fl. yellow.

Distr. British Guiana and Rio Branco, Brazil.

BURSERACEAE.

***Protium Sagotianum** *March.*

Simuni Creek, Rupununi River, c. 350 ft., Aug., *Davis* in *F.D.* 2126, 2139 : trees about 60–80 ft. high and 6–12 in diam. in miscellaneous forest on high slope on gravelly soil ; fl. white, sweet-scented.

Vernacular name (Arawak), " Kurokai " (black kind).

Distr. Surinam, French Guiana.

Protium crenatum *Sandwith*, sp. nov. ; *P. Copal* (Schlecht. et Cham.) Engl. affinis, foliolis conspicue crenato-serratis, petalis sparse puberulis tantum statim distinguitur.

Arbor excelsa, circiter 30 m. alta, ramulis summis pubescentibus lenticellatis. *Folia* imparipinnata, petiolo rhachi gracili subtereti petiolulis costa nervisque minute puberulis vel demum fere glabris ; petiolus 2·5–8 cm. longus ; internodia rhacheos 2–4·8 cm. longa ; petioluli 3·5–8 mm. longi ; foliola opposita, 3–4-juga, nonnunquam in foliis inflorescentias subtendentibus 1–2-juga, lanceolata usque oblonga, apice acuminata, basi rotundata lateribus inaequalibus, 5–12 cm. longa, 2·1–4·5 cm. lata, costa nervisque saepe minute puberulis exceptis glabra, chartacea, nitidula, marginibus nisi basin versus integris conspicue crenato-serratis, nervis primariis utroque costae latere 12–15 supra tenuibus subtus prominentibus, rete venularum supra impresso vix cernendo subtus subtilissimo satis conspicuo. *Inflorescentiae* e basi ipsa multiramosae, ramis ipsis simplicibus, ramis basalibus saepe brevibus multifloris confertis, anguste pyramidali-thyrsoideae, folium subtendens haud aequantes, 4–18 cm. longae, puberulae ; rami inferiores (suprabasales) nonnunquam 5 cm. longi ; cymae brevissime pedunculatae vel sessiles ; pedicelli 0·5–1·5 mm. longi. *Calyx* turbinatus, 1–1·5 mm. longus, 2·2 mm. latus, utrinque puberulus ; lobi late ovati, magnitudine variabili, usque 0·4 mm. longi. *Petala* 4–5, ovato-lanceolata usque ovata, obtusa, 2·8–3 mm. longa, 1·5–1·75 mm. lata, apice recurvata, utrinque sparse puberula. *Stamina* 8–10, filamentis glabris 1·5 mm. longis, antheris nigrescentibus 0·5 mm. longis. *Discus* glaber, apice plano-umbilicatus, conspicue 8–10-lobatus atque sulcatus, 2 mm.

diametro. *Ovarium* globosum, pilosum, in disco immersum, 0·3 mm. longum, 0·5 mm. diametro, stylo brevissimo. *Fructus* non visus.

BRITISH GUIANA. Northern side of Kanaku Mountains, about 10 miles east of Takutu River, Sept. 1931, *Davis* in *Forest Department* no. 2195 : a tree about 100 ft. high and 18 in. diam., in miscellaneous forest at the foot of the mountains at about 450 ft. ; flowers green.

Vernacular name (Arawak), " *Kurokai*," a name given to other species of *Protium*.

The crenate-serrate leaflets recall those of the Asiatic *P. serratum* (Colebr.) Engl.

***Tetragastris panamensis** (*Engl.*) *O. Kze.*

N. side of Kanaku Mts. about 10 miles east of Takutu River, c. 450 ft., Oct., *Davis* in *F.D.* 2197 : tree about 60 ft. high and 10 in. diam. in miscellaneous forest at foot of mountains ; fl. pale green, white inside corolla tube.

Vernacular name (Arawak), kind of " Haiowaballi."

Distr. Central America to French Guiana, see R. Benoist in Bull. Soc. Bot. France, lxvi, 360 (1919).

MELIACEAE.

***Trichilia (§ Moschoxylum) Smithii** *C.DC.*—*T. oblanceolata* Rusby. *T. Cruegeriana* Urb.

N. side of Kanaku Mts. about 10 miles east of Takutu River, c. 450 ft., Oct., *Davis* in *F.D.* 2211 : tree about 70 ft. high and 8 in. diam., in miscellaneous forest near bank of creek at foot of mountains ; fl. green with a whitish staminal tube.

Distr. Colombia, Trinidad.

***Trichilia** (**§ Apotrichilia,** *fide* C.DC.) **surumuensis** *C.DC.*

N. side of Kanaku Mts., about 10 miles east of Takutu River, c. 450 ft., Sept., *Davis* in *F.D.* 2189 : undergrowth tree about 15 ft. high and 2 in. diam., on bank of a stream in Kokerite (*Maximiliana*) forest fringing foot of mountains ; calyx and corolla pale green, staminal tube white and translucent.

Distr. Rio Branco (*Ule* !).

Trichilia (§ Choriopetion) leucastera *Sandwith*, sp. nov. ; inter species huius sectionis a *T. lepidota* Mart. foliolis 4-jugis acuminatis statim distinguenda ; a *T. Schumanniana* Harms atque *T. angustiore* Harms pilis stellatis plerumque cinereo-albis, inflorescentia pyramidali multo magis florifera ramis longis multifloris, floribus minoribus differt ; a *T. Taubertiana* Harms foliolis haud bullatis recedit ; a *T. stelligera* Radlk. foliolis 4-jugis nervis lateralibus magis numerosis, inflorescentia magna multo longiore, petalis intus basi tantum glabris, staminibus omnino liberis facile distinguitur.

Arbor satis excelsa ; ramuli summi costati, pilis stellatis pallide brunneis dense tomentelli. *Folia* magna 25–38 cm. longa, petiolo rhachi petiolulis indumento stellato dense tomentellis ; petiolus supra applanatus, 7–9·5 cm. longus ; internodia rhacheos supra

leviter canaliculata, 2·5–5 cm. longa; petioluli 2–6 mm. longi; foliola 4–juga, opposita vel alterna, ovato-oblonga, oblongo-lanceolata, vel oblanceolata, terminalia obovato-lanceolata, apice breviter sed conspicue cuspidata, basi cuneata usque obtusa (foliola terminalia valde cuneata), 5·5–15 cm. longa, 2·3–7·2 cm. lata, firme chartacea, supra pilis stellatis albescentibus per costam nervosque satis densis ceterum sparsis pubescentia, subtus similiter sed densius induta, costa nervisque primariis supra impressis subtus prominentibus, venulis supra vix cernendis subtus tenuissimis satis conspicuis luce transmissa pellucidis, nervis primariis utroque costae latere 12–18 ascendentibus. *Inflorescentiae* magnae, pyramidales, 10–24 cm. longae, foliis subtendentibus breviores, pilis stellatis densis cinereo-albis ubique tomentellae; rami valde floriferi, ramulosi, primarii inferiores saepe 6·5–10·5 cm. longi; pedicelli vix ad 2 mm. longi; bracteae subulatae, circiter 1 mm. longae, bracteolae breviores. *Flores* pentameri, statu vivo cremeo-albi, odori. *Calyx* cupularis, ad 1·5 mm. longus, extra stellato-tomentellus, intus glaber, dentibus late deltoideis acutis circiter 0·5 mm. longis. *Petala* libera, ovato-lanceolata, obtusa, 3·2–3·5 mm. longa, ad 1·5 mm. lata, extra dense subsericeo-cinereo-tomentella, intus basin versus glabra ceterum pulverulento-puberula. *Stamina* 10, libera, filamentis glabris a basi sensim angustatis inaequalibus ad 2 mm. longis apice brevissime bidentatis; antherae globosae, 0·3–0·5 mm. longae atque latae. *Ovarium* triloculare, loculis biovulatis, dense cinereo-stellato-pilosum, applanato-pulviniforme, circiter 1·75 mm. diametro; stylus brevis, tumidus, glaber, cum stigmate rotundato-obtuso 0·7 mm. longus. *Fructus* ignotus.

BRITISH GUIANA. Simuni Creek, Rupununi River, Aug. 1931, *Davis* in *Forest Department* no. 2140: tree about 80–90 ft. high, 14 in. diam., with slightly fluted base to the trunk, in miscellaneous forest at 350 ft.; flowers creamy-white, sweet-scented.

Vernacular name (Arawak), *Ulu*; but this is also given to species of Burseraceae.

Trichilia (§ Eutrichilia) Davisii *Sandwith*, sp. nov.; *T. triphyllae* Blake e descriptione affinis, indumento foliolorum, inflorescentiis brevissimis congestifloris, praesertim calyce profunde lobato differt; a *T. flava* C.DC. foliolis 1–3 tantum, calyce majore profunde lobato, praeterea a *T. Goudotiana* Tr. et Pl. atque *T. montana* Kunth ob indumentum foliolorum pauciorum statim distinguenda; *T. palmetorum* Pittier foliolis obovato-oblongis apice emarginatis supra glabris e descriptione optime differt.

Arbor parva, ramulis teretibus dense flavescenti-tomentosis, nonnunquam ob tomentum delapsum glabrescentibus tum striatis purpurascentibus lenticellatis. *Folia* trifoliolata vel unifoliolata atque sub lamina articulata, 9·5–21 cm. longa, petiolo rhachi petiolulisque indumento ramulorum tomentosis; petiolus 2–5 cm. longus; internodium rhacheos cum petiolulo terminali 0·4–1·8 cm. longum; petioluli laterales (atque in foliis pseudosimplicibus terminales) 2–3 mm. longi ; foliola (lateralia opposita) ovata, ovato-oblonga, elliptica, vel oblongo-elliptica, apice breviter acute cuspidata, basi cuneata acuta usque obtusa vel in foliolis lateralibus subrotundata, terminalia 8·5–15·2 cm. longa, 4·6–8 cm. lata, lateralia atque solitaria minora 4·8–11·5 cm. longa, 3–6·5 cm. lata, chartacea, supra costa tomentosa ceterum ubique plus minusve pubescentia, subtus ubique praesertim costa nervisque molliter pilosa subvelutina, nervis primariis utroque costae latere 10–15 arcuato-ascendentibus atque prope marginem anastomosantibus, rete venularum supra subtilissimo inconspicuo subtus laxiore prominente. *Inflorescentiae* brevissimae, ad 1·5 cm. longae, saepius circiter 1 cm. diametro, densiflorae, a basi ramosae, ubique dense flavescenti-villosulae ; pedicelli usque 2 mm. longi ; bracteae bracteolaeque lanceolatae, 1·5–2·2 mm. longae, 0·5–1 mm. latae. *Calyx* extra dense flavido-villosulus, profunde 4-partitus, lobis ovato-lanceolatis 1·5–1·75 mm. longis ad 1·2 mm. latis. *Petala* 4, libera, obovato-oblonga, 4·5 mm. longa, ad 2·5 mm. lata, extra praesertim dimidio superiore pubescentia, intus furfuraceo-puberula. *Tubus staminalis* 1·75 mm. longus, apice circiter 2·75 mm. diametro, glaber, basi carnoso-incrassatus ; filamenta libera 8, pilosa, dentibus apicalibus inclusis 1·5 mm. longa, saepe fere ad 1 mm. lata, dentibus 0·5 mm. longis ; antherae pubescentes, 0·75 mm. longae. *Ovarium* dense longe villosum, subgloboso-conoideum, 0·5 mm. longum atque diametro ; stylus sparse pilosus, cum stigmate capitato 1 mm. longus. *Fructus* ignotus.

BRITISH GUIANA. Rupununi River, on the right bank a few miles above the mouth of the Maparri Creek, Sept. 1931, *Davis* in *Forest Department* no. 2167 : an undergrowth tree, about 25 ft. high and 8 in. diam., growing on and among boulders at summit of a mountain in ? *Attalea* sp. forest at 1000 ft. ; flowers cream.

Guarea Davisii *Sandwith* sp. nov. ; foliolis 4–5-jugis satis paucinerviis, inflorescentiis plerumque e ramulis vetustioribus orientibus, floribus magnis tetrameris, calyce magno bilabiatim fisso, ovario hirsuto distinguenda ; *G. Ulei* C.DC. atque *G. suberosa* C.DC. floribus (praesertim calycibus) multo minoribus differunt ; *G. Poeppigii* C.DC. e descriptione inflorescentiis dense flavido-villosis, floribus sessilibus, nervis foliolorum lateralibus magis numerosis differt ; *G. fissicalyx* Harms foliolis 6–7-jugis angustioribus, inflorescentia longiore, petalis 5, antheris 10–13, stylo inferne piloso e descriptione valde differt ; *G. pubiflora* Juss. folii rhachi marginato-alata, inflorescentiis e foliorum axillis orientibus, petalis extra magis flavido-sericeis differt.

Arbor parva, circiter 12 m. alta. *Folia* magna, usque 44 cm. longa, petiolo rhachique exalata angulatis glabris, petiolo 6–8 cm. longo, internodiis rhacheos 4·3–6·5 cm. longis, petiolulis glabris nigris supra canaliculatis 3–5 mm. longis ; foliola 4–5-juga, opposita vel fere opposita, inferiora ovata, cetera satis anguste oblonga usque oblanceolata, apice usque 2 cm. cuspidata vel acuminata, basi cuneata acuta, 9–22 cm. longa, 5–8·5 cm. lata, chartacea, glabra, creberrime punctulata, utrinque pulchre intricate reticulata, nervis primariis utroque costae latere circiter 10–12 laete arcuantibus atque fere margine ipso anastomosantibus. *Inflorescentiae* e ligno vetere exorientes, nonnunquam in ramulis novellis axillares, anguste thyrsoideae, simplices vel basi pauciramosae, satis breves, 3–18 cm. longae, adpresse cinereo-pubescentes; cymae breviter pedunculatae, 3-florae vel sursum 1-florae, pedicellis brevibus 1–3 mm. longis; bracteae bracteolaeque minutae, dense pubescentes. *Calyx* irregulariter bilabiatim 4-lobatus, 4–5 mm. longus, extra siccitate purpureus satis sparse minute pubescens, intus glaber venosus; lobi ovati, usque 3 mm. lati, saepe angustiores. *Petala* 4, lanceolata, 8·5 mm. longa, ad 3·25 mm. lata, apice incrassata inflexa, extra indumento duplici (pilis aliis satis longis minimis aliis) adpresse pubescentia, intus trientibus duobus superioribus pulverulenta ceterum glabra. *Tubus stamineus* cylindricus, 6·5–7 mm. longus, glaber, margine crenulato-sinuato; antherae 8 infra apicem insertae, fere 1 mm. longae. *Gynophorum* late stipitiforme, 0·75 mm. longum, glabrum, tum in discum ovario latiorem apice pilosum dilatatum. *Ovarium* conoideum, circiter 2 mm. longum atque diametro, dense flavescenti-pilosum; stylus glaber, sulcatus, ad 4 mm. longus, stigmate discoideo circiter 1 mm. diametro. *Fructus* ignotus.

BRITISH GUIANA. Apoteri, Rupununi River, July 1931, *Davis* in *Forest Department* no. 2092: a small tree about 35 ft. high and 3 in. diam., in miscellaneous forest on hill slope at 300 ft.; flowers milk-white, sepals cream, some dashed with red, strongly scented; inflorescences cauliflorous on branches and axillary on younger shoots.

Vernacular name (Arawak), *Kufiballi* ("resembling the Coffee tree").

***Cedrela odorata** *L.* sens. Ducke et Harms.

Simuni Creek, Rupununi River, c. 350 ft., Aug., *Davis* in *F.D.* 2117: large tree 120 ft. or more high, 3 ft. diam., buttressed with high thick buttresses to about 7 ft., in miscellaneous forest; fl. pale green.

Local name, "Red Cedar" (brown kind).

Distr. West Indies to the Amazons.

OLACACEAE.

***Clavapetalum elatum** (*Ducke*) *Ducke.—Asterolepidium elatum* Ducke.

Wismar, Aug. 1924, *Persaud* 113: tree on river bank; fl. brown.

Distr. Brazil (Pará). Perhaps conspecific with *C. surinamense* Pulle of Surinam, which has not been examined.

RHAMNACEAE.

***Zizyphus Cinnamomum** *Tr. et Pl.*

S. side of Kanaku Mts., right bank of Rupununi River near Sand Creek, c. 1200 ft., Oct., *Davis* in *F.D.* 2243: tree about 100 ft. high

and 16 in. diam., on hill slope in forest, very abundant ; fl. green with yellow disc.

Distr. Colombia (*Linden* 1548 !), Venezuela (Valencia, *Funck* 794 !).

Probably conspecific with *Z. melastomoides* Pittier. *Z. Cinnamomum* is not given in Pittier's list of the Venezuelan species of *Zizyphus* in his Quinta Decada de Arboles y Arbustos Nuevos de Venezuela (1925), but *Z. melastomoides* is recorded from near Valencia.

ANACARDIACEAE.

***Loxopterygium Sagoti** *Hk. fil.*

Karakara Creek, Demerara River, Feb. 1910, *C. W. Anderson* in *F. D.* 175. Mora-mora-bisi Creek, Mapenna River, Corentyne River, May 1918, *Hohenkerk* in *F. D.* 175A. Apoteri, Rupununi River, July 1931, *Davis* in *F. D.* 2100 : tree about 100 ft. high and 20 in. diam. on gentle slope in rather low miscellaneous forest ; latex pale greenish-yellow, thick and sticky, it raises blisters on the skin of some people.

Vernacular name (Arawak), " Hububalli."

Distr. French Guiana.

LEGUMINOSAE.

***Myroxylon** sp.

Foot of Kanaku Mts., near source of Moco-Moco Creek, Takutu River, c. 400 ft., fl. Oct., *Davis* in *F. D.* 2203 : a large tree, 120–130 ft. high, about 24 in. diam., near foot of a mountain slope amongst boulders in miscellaneous forest.

Vernacular name (Wapisiana), " Sirkir " ?

This is the first certain record from British Guiana of this famous genus, but readers of Richard Schomburgk's travels will find that when staying at Watu-Ticaba, S. of the Kanaku Mountains, he noted that the Wapisiana women wore necklaces made of the seeds of *Myroxylon*, and was told that the trees grew in abundance at a distance of two days' journey from the village (see Roth, Transl., ii. p. 307). Mr. Davis' discovery of *Myroxylon* in this region is an interesting confirmation of this statement. In the absence of fruit and seeds, it is impossible to decide whether his material should be referred to *M. peruiferum* or to *M. Balsamum*.

***Ormosia Coutinhoi** *Ducke.*

Mahaica Camp, Moblissa Path, Demerara River, fl. March, 1910, *C. W. Anderson* in *F. D.* 582. Bartica-Potaro Road, 54th mile, *Dawson* in *F. D.* 2013 : tree 60 ft. high in wallaba forest on white sand ; fl. a soft purplish colour.

Distr. Brazil (Pará, *Ducke* 15491 !).

***Parkia nitida** *Miq.*—*P. ingens* Ducke.

Simuni Creek, Rupununi River, N. of Kanaku Mts., c. 350 ft., fl. Aug., *Davis* in *F. D.* 2116 : tall tree, 125 ft. high, 24 in. diam., strongly buttressed to about 5 ft., near top of a slope in miscellaneous forest; filaments of infertile fl. yellow, fertile fl. cream, buds dark brown.

Distr. Surinam, Brazil (Pará).

It does not seem possible to distinguish *P. ingens* from *P. nitida*, which was not mentioned by Ducke in his key to the Brazilian species of *Parkia* in Arch. Jard. Bot. Rio de Janeiro, iv. 35–39 (1925), although he cites both names in his conspectus of the four groups of the genus in Notizbl. Bot. Gart. Berlin xi. 471–2 (1932).

***Parkia Ulei** (*Harms*) *Kuhlm.—Leucaena Ulei* Harms.

Yawakuri River, Berbice, fl. June 1919, *Hohenkerk* in *F. D.* 397A: tree 170 ft. high, on brown sand at foot of hill. Simuni Creek, Rupununi River, c. 350 ft., fl. Aug. 1931, *Davis* in *F. D.* 2113: tall tree about 120 ft. high, 18 in. diam., on sandy clay soil on gentle slope in tall miscellaneous forest; bole smooth, cylindrical, not buttressed, crown small and flat-topped; fl. creamy-white.

Vernacular name, "Uya (brown)," *fide* Hohenkerk.

Distr. Widely distributed in Amazonian Brazil. Surinam (*P. microcephala* Kleinh., which is regarded as synonymous with *P. Ulei* by Ducke, see Notizbl. Bot. Gart. Berlin xi. 471).

ROSACEAE.

***Hirtella obidensis** *Ducke.*

Kanaku Mts., near right bank of Rupununi River a few miles south of Maparri Creek, c. 800 ft., fl. Sept., *Davis* in *F. D.* 2166: tree about 90 ft. high, 14 in. diam., on steep hill slope on red sand soil in miscellaneous forest with palm (probably *Attalea* sp.) dominant; petals white; stamens and style deep pink.

Distr. Amazonian Brazil (near Obidos).

Agreeing very well with *Ducke* 19764 from Juruty Velho.

RUBIACEAE.

***Alseis longifolia** *Ducke.*

Simuni Creek, Rupununi River, c. 350 ft., Aug., *Davis* in *F. D.* 2145: tree with fluted bole, about 80 ft. high and 10 in. diam., in miscellaneous forest with Balata; fl. pale green, sweet-scented.

Distr. Brazil (lower Rio Trombetas and Rio Branco de Obidos, *Ducke*).

The calyx-lobes of this material are narrower and more ovate-lanceolate than those of *Ducke* 21690, from the lower Rio Trombetas.

Randia asperifolia (*Sandwith*) *Sandwith* comb. nov.—*Basanacantha asperifolia* Sandwith in Kew Bull. 1932, 470.

This species is now placed in *Randia* in order to fall into line with the view current among American botanists.

***Guettarda acreana** *Krause.*

Apoteri, Rupununi River, c. 300 ft., fl. June, *Davis* in *F. D.* 2065: tree of second story or lower part of canopy, with slightly fluted trunk and large crown, growing in miscellaneous forest on rather low ground; fl. greenish-white.

Distr. Brazil (Rio Acre, *Ule* !).

Differs from the type material (*Ule* 9709) in the pubescent hypanthium. The following additional collections have been received which seem to be referable to this species: Mt. Iramaikpang, Kanaku Mts., 1200 ft., Aug. 1932 (leaves only), *Fr. Mather*, S.J. in *F. D.* 2302; and Lower Camaria, Cuyuni River, fr. Sept. 1932, *Davis* in *F. D.* 2317. The last collection bears fruits which are black, terete, and glabrous, ovoid-ellipsoid, 7 mm. long and 4–6 mm. diameter, crowned with the very inconspicuous remains of the calyx.

Vernacular name (Arekuna), " Yakki." The bark is used by the Makusi Indians in the preparation of the arrow-poison " curare," and the tree is probably well distributed in the Pacaraima region.

It is misleading to describe the calyx of *Guettarda* as invariably truncate. That of the present species is conspicuously lobate, the remains of the lobes surviving on the mature fruit. For similar calyces, compare *G. Tournefortiopsis* Standley, *G. discolor* Rusby or *G. hirsuta* (R. & P.) Pers.

***Appunia aurantiaca** (*Krause*) *Sandwith* in Kew Bull. 1931, 472.

North side of Kanaku Mts., about 10 miles east of Takutu River, c. 450 ft., Oct., *Davis* in *F. D.* 2222: shrub about 4 ft. high, at the edge of forest bordering savannah; fl. pure white.

Distr. Bio Branco (*Ule* !)

Agrees perfectly with Ule's specimen but the pure white flowers (Ule described them as yellowish-orange) remove one of the few good distinctions between this species and its very close ally *A. tenuiflora* which has been frequently collected in British Guiana.

Rudgea tanaosepala *Sandwith* sp. nov.; facie *R. Hostmannianae* Benth., forma stipularum, bracteis laciniisque calycinis longe subulato-filiformibus, stigmatibus nunc papillatis nunc dense lanatis valde distincta.

Frutex humilis: ramuli summi novelli compressi, minute puberuli vel glabrescentes, ad 2·5 mm. lati. *Folia* oblanceolata, apice longe attenuata acute acuminata, basi longe attenuata cuneata, 8·5–17 cm. longa, 2·1–5·3 cm. lata, firme chartacea, glabra, supra siccitate olivacea vel saepius nigrescentia, subtus pallide viridia, nervis primariis utroque costae latere 10–12 patulo-adscendentibus utrinque cum venulis laxe haud valde reticulatis: petiolus 3–6 mm. longus, glabratus vel minute puberulus. *Stipulae* glabrae, vagina 2–3 mm. longa, apice integra truncata, sed infra apicem dentibus 4 subulatis nonnunquam bifidis 3–6 mm. longis praedita, praeterea utroque axis latere dente 7–9 mm. longo 1–1·75 mm. lato apice bifido saepius etiam lacerato-fimbriato dentes ceteros superante infra apicem instructa. *Inflorescentia* terminalis, passim pilosula, brevis, 2–3 cm. longa, 2–3·5 cm. lata, thyrsoidea, inferne dichasiis verticillatim dispositis; pedunculus basalis 0·7–1·3 cm. longus, pedunculi

dichasiorum 3–8 mm. longi; bracteae bracteolaeque anguste subulato-filiformes, bracteae 7–9 mm. longae, bracteolae paulo breviores. *Flores* sessiles, albi, petalis in alabastro cornutis. *Hypanthium* 1·75 mm. longum, 1·2 mm. latum, glabrum vel superne parce puberulum. *Calycis* dentes subulato-filiformes, 4·5–5·2 mm. longi, igitur hypanthio multo longiores, conspicue pilosuli. *Corollae* tubus 7 mm. longus, extra glaber, intus sub fauce dense lanatus ceterum glaber; lobi oblongo-lineares, 5–6 mm. longi, minute pulverulenti, sub apice cornibus sparse pilosulis 1·2–2 mm. longis instructi. *Stamina* vel sub fauce inclusa subsessilia vel longe exserta filamentis 6 mm. longis; antherae usque 2·2 mm. longae, in staminibus inclusis breviores. *Stylus* 1 cm. longus; in flore staminibus inclusis praedito cum stigmatibus dense papillatus; in flore staminibus longe exsertis praedito glaber stigmatibus dense lanato-pilosis.

BRITISH GUIANA. Simuni Creek, Rupununi River, August 1931, *Davis* in *Forest Department* no. 2149: a low and bushy undergrowth shrub about 3–8 ft. high, in mora forest at about 350 ft.; flowers white.

The long subulate calyx-teeth of this plant are evidently shared by very few other species of the genus, the only good example met with being *R. discolor* Benth. The dimorphism in the indumentum of the style and stigmas, in conjunction with that of the stamens, is very peculiar and suggests interesting adaptations for purposes of cross-fertilisation. Hairy styles or stigmas are already known in *R. lasiostylis* Müll. Arg. and *R. lasiostylis* Krause (the latter species presumably requires a new name), but this part of the flower is hardly mentioned in many recent descriptions and might repay further study.

BORAGINACEAE.

***Cordia trichotoma** (*Vell.*) *Arrab. ex Steud.*

N. side of Kanaku Mts., about 10 miles E. of Takutu River, c. 450 ft., Oct., *Davis* in *F. D.* 2221; small tree about 15 ft. high, 3 in. diam., in low secondary forest near the edge of the savannah; fl. pure white, calyx green with silvery scales. Pirara (Marakanata), Rupununi Savannahs, c. 400 ft., Sept., *Davis* in *F. D.* 2186: tree about 68 ft. high and 15 in. diam., on sandy soil in patch of savannah forest on top of a ridge; leaves and buds glaucous green.

Vernacular names, " Taparai " (Wapisiana); Brown Silverballi (Arawak).

Distr. E. Brazil to Paraguay, N. W. Argentina, and Bolivia; also on the Rio Branco, Brazil. See I. M. Johnston in Contr. Gray Herb. xcii. 15 (1930).

Agrees with *Ule* 8292, from the neighbouring Rio Branco, which is referred to *C. trichotoma* by Johnston.

***Lepidocordia punctata** *Ducke* in Arch. Jard. Bot. Rio de Janeiro iv. 171, pl. 22 (1925).

Right bank of the Rewa River, about 14 miles S.S.E. of its mouth, (i.e. confluence with Rupununi River), c. 300 ft., July, *Davis* in *F. D.* 2082: tree about 100 ft. high and 24 in. diam. or more, deeply fluted, growing in Balata (*Mimusops*) forest on a low hill with red clayey soil.

Distr. Brazil (Rio Branco de Obidos, *Ducke* !).

An interesting extension of the range of a recently described and most unusual tree. The type locality in Brazil is also on a red-clay soil, where the tree flowers from November to January (*fide* Ducke, l.c.).

LAURACEAE.

Aniba anisosepala *Sandwith* sp. nov.; *A. Brittenii* Mez ob perianthii lobos perinaequales similis, ab hac foliis multo latioribus basi ipsa in petiolum rotundatis, inflorescentia ampla multiflora puberula statim distinguitur.

Arbor parva, circiter 18 m. alta; ramuli summi glabri, pallide purpurascentes, subteretes, lenticellati, apicem versus 3 mm. diametro. *Folia* ramulos terminantia, congesta, obovato-elliptica, apice abrupte conspicue acuminata vel fere cuspidata, basin versus longe attenuata sed basi ipsa in petiolum manifeste rotundata, 11–18·5 cm. longa, 4·5–6·8 cm lata, firme chartacea, glabra, utrinque satis opaca, costa nervisque primariis utrinque prominentibus, reticulatione supra immersa subtus satis prominente sed tenui, nervis primariis utroque costae latere vulgo 12–16, in medio costam angulo circiter 60° relinquentibus, satis longe (in medio folio nonnunquam ad 1 cm.) a margine anastomosantibus; petiolus supra canaliculatus, 4–7 mm. longus. *Inflorescentiae* apice ramulorum pseudoterminales, aggregatae, multiflorae, foliis multo (saepe dimidio) breviores, ad 11 cm. longae, anguste pyramidales, fere ubique cinereo-puberulae, pedunculo primario purpurascente basi glabrescente; pedicelli in perianthii tubum sensim transientes, dense cinereo-puberuli vel tomentelli, sulcati, tubo incluso 1·75–3·2 mm. longi. *Perianthium* cremeum; tubus anguste obconicus, in pedicellum sensim transiens, apice haud constrictus sed in limbum abrupte transiens; limbus subglobosus, ad 1·8 mm. diametro; lobi valde inaequales, intus concavi, ciliati ac utrinque puberuli; exteriores interioribus multo minores, deltoideo-ovati, obtusi, 0·75 mm. longi, 0·5–0·6 mm. lati; interiores ovati, obtusi, 1·25 mm. longi, ad 1·25 mm. lati. *Stamina* serierum duarum exteriorum introrsa; filamenta utrinque lanato-pilosa, 0·5–0·7 mm. longa, antheris aequilata vel paulo angustiora et multo longiora; antherae late ovatae vel suborbiculares, connectivo supra loculos rotundato-obtuso, 0·25 mm. longae, ad 0·4 mm. latae, glabrae; series tertia similis, extrorsa, glandulis sessilibus obovoideo-oblongis ad 0·5 mm. longis ad 0·3 mm. latis. *Ovarium* brunneum, glabrum, ellipsoideo-fusiforme, 1·2 mm. longum, ad 0·5 mm. latum, in stylum brunneum glabrum ad 0·75 mm. longum transiens; stigma pro rata magnum, nigrum, irregulariter plano-discoideum, 0·75 mm. diametro. *Fructus* maturus ignotus; iam valde immaturus ovoideo-ellipsoideus, 1·5–2·5 mm. longus, ad 1·5 mm. diametro, perianthii tubo immersus atque lobis coronatus.

British Guiana. Kanaku Mts., near Nappi Creek (a tributary of the Pirara River), c. 800 ft., Oct. 8th, 1931, *Davis* in *Forest Department* no. 2216: a small tree, about 60 ft. high and 6 in. diam., growing in miscellaneous forest on top of a ridge with reddish, sandy, loam soil; flowers cream.

***Acrodiclidium debile** *Mez* in Jahrb. Bot. Gart. Berlin, v. 99 (1889) descr. ex inflorescentiis plane evolutis ampliata.

Arbor parva vel frutex, circiter 6 m. alta; ramuli summi graciles, tenues, cinnamomei, pubescentes, hornotini saepe basi dense fulvo-pilosuli; internodia ramulorum hornotinorum 3·5–4·5 cm. longa. *Folia* opposita, elliptica usque ovato-elliptica, apice satis abrupte longe conspicue caudato-acuminata, acumine 1·2–2·4 cm. longo, basi cuneata saepius acuta, 8·2–14·5 cm. longa, 2·9–5·5 cm. lata, chartacea, utrinque satis nitida, supra juventute sparse adpresse pilosa mox glabra costa nervisque minute puberulis exceptis, subtus ubique sparse adpresse pilosa, nervis primariis utroque costae latere circiter 6–8 inter se longe a margine (in medio folio 0·5–1·5 cm.) arcuato-anastomosantibus, his cum costa supra satis obscuris subtus prominentibus, rete venularum intricato utrinque sed praesertim subtus manifesto; petiolus gracilis, supra canaliculatus, minute puberulus, 6–7 mm. longus. *Inflorescentiae* in ramulis hornotinis ex axillis cataphyllorum exorientes, oppositae, nonnunquam pseudo-terminales, gracillimae, flexuoso-arcuatae, 2–8 cm. longae, floribus ipsis exceptis ubique inconspicue pubescentes, inferne nudae, dimidio superiore ramosae, ramis imis ad 1·5 cm. longis, floribus apice ramorum subumbellatis 3–5 vel raro singulis; pedicelli 2·5–6 mm. longi. *Flores* albi. *Perianthium* omnino glabrum tubo intus piloso excepto; tubus obconicus, apice haud constrictus, circiter 1·3 mm. longus, 1·7 mm. latus; lobi subaequales, late ovato-suborbiculares, rotundato-obtusi, circiter 1 mm. longi atque lati. *Stamina* glabra, serierum 2 exteriorum staminodialia; series prima foliacea, sessilis, quadrato-rotundata, circiter 0·6 mm. longa atque lata; secunda obovato-spathulata, ad 0·7 mm. longa, lamina semi-orbiculari ad 0·4 mm. lata, filamento angustiore distincto laminam aequante; series tertia fertilis, extrorsa, 1 mm. longa, 0·6 mm. lata, filamento antherae aequilato sed longiore, connectivo supra loculos brevissime producto rotundato-obtuso, glandulis minimis circiter 0·25 mm. longis atque latis. *Ovarium* glabrum, ovoideum, 1 mm. longum, ad 0·7 mm. diametro, in stylum glabrum 1 mm. longum transiens, stigmate minuto inconspicuo. *Fructus* ignotus.

British Guiana. Kanaku Mountains; near Nappi Creek (a tributary of the Pirara River), c. 700 ft., Oct. 8th, 1931, *Davis* in *Forest Department* no. 2218: a small bushy undergrowth tree or shrub, about 20 ft. high and 3 in. diam., growing on a steep slope in miscellaneous forest; flowers white.

FRENCH GUIANA. Without locality, *Patris* 53 (typus in Herb. Candoll., Geneva !).

An interesting rediscovery of a rare and little-known species.

***Silvia Duckei** (*Sampaio*) *Sampaio.—Misanteca Duckei* Sampaio.

Kanaku Mountains, near source of Moco-Moco Creek, Takutu River, c. 600 ft., *Davis* in *F. D.* 2196 : tree about 80 ft. high, 16 in. diam., in miscellaneous forest on a steep rocky slope ; fl. green.

Distr. Rio Branco, Brazil.

***Ocotea canaliculata** (*Rich.*) *Mez.*

Mazaruni Station, June 1932, *Davis* in *F. D.* 2291 : tree of main canopy, specimen taken from coppice shoot in heavily burnt secondary forest on light brown sand soil ; fl. pale greenish-yellow.

Vernacular name (Arawak), " White Silverballi."

Distr. Trinidad to French Guiana and N. Brazil.

PROTEACEAE.

Roupala suaveolens *Klotzsch* var. **minor** *Meisn.* e descr.

Kusad Mountain, Southern Rupununi Savannahs, c. 1300 ft., fl. Oct., *Davis* in *F. D.* 2226 : tree about 50 ft. high and 8 in. diam., on a steep rocky slope near summit of mountain ; fl. creamy-yellow.

Distr. Endemic.

LORANTHACEAE.

***Psittacanthus plagiophyllus** *Eichl.*

Issororo Creek, Pomeroon River, Feb., *Davis* in *F. D.* 2266 : parasitic shrub, apparently peculiar to *Didymopanax Morototoni*, in second growth forest.

Vernacular name (Arawak), " Werokarotika."

Distr. Amazonian Brazil.

TRIURIDACEAE.

***Sciaphila purpurea** *Benth.*

Simuni Creek, Rupununi River, c. 350 ft., Aug., *Davis* in *F. D.* 2150 : saprophyte with deep plum-coloured flowers growing in miscellaneous forest.

Distr. Brazil : Panuré, Rio Uaupes, *Spruce.*

Spruce collected it on termites' nests on trees, more rarely on the ground. The British Guiana material agrees very well with his specimens, which were gathered in January 1853.

NEW PIPERACEAE COLLECTED BY THE OXFORD EXPEDITION, 1929

(WM. TRELEASE).

Piper moraballianum *Trel.* sp. nov.

Frutex parvus ; internodia floralia gracilia, brevia, subtiliter velutina. *Folia* lanceolata vel lanceolato-elliptica, acuminata, basi obtusa aequilatera vel subacuta uno latere breviore, 8–16 cm. longa, 3–8 cm. lata, e dimidio inferiore pinnatinervia, nervis majoribus utroque costae latere 4–5 sursum arcuato-anastomosantibus, subtus nervis velutina, glandulis numerosis minutis pellucidis, siccitate membranacea nigrescentia; petiolus in foliis aequilateris 5 mm. longus ac alatus, vel 1–4 mm. longus exalatus, velutinus. *Spicae* 1·5 cm. longae, 2 mm. latae, apiculatae; pedunculus filiformis, 5 mm. longus, velutinus; bracteae rotundato-subpeltatae, ciliolatae; stigmata sessilia.

BRITISH GUIANA. Moraballi Creek, Essequibo River, 1929, *Sandwith* 361 (typus) atque 19 (Herb. Kew.): low shrub in forest; leaves obscurely downy beneath.

Piper Wachenheimii *Trel.* sp. nov.

Frutex parvus, siccitate nigrescens; internodia satis gracilia, brevia, pilis rectis dense rubro-pubescentia. *Folia* lanceolata usque elliptica, subcaudate acuminata, basi cuneata, 11–15 cm. longa, 4–6·5 cm. lata, e dimidio inferiore pinnatinervia, nervis majoribus utroque latere costae 4–5, leviter revoluta, supra glabra nitida, subtus glanduloso-granulosa in nervis venisque longioribus rubro-hirsuta; petiolus circiter 10 mm. longus, rubro-hirsutus, haud vaginans. *Spicae* 0·4–8 cm. longae, cuspidatae; pedunculus 5–10 mm. longus, rubro-hirsutus. *Baccae* depresso-globosae, apice umbilicatae, granulosae; stigmata 3, sessilia.

FRENCH GUIANA. Godebert, *Wachenheim* 168 (Herb. Paris.).

BRITISH GUIANA. Moraballi Creek, Essequibo River, *Sandwith* 231 (typus in Herb. Kew.).

XLI—NEW OR LITTLE-KNOWN PLANTS FROM SOUTH INDIA: II.*

Arisaema Wightii *Schott* was first described in Bonplandia, **7**, 26 (1859) from *R. Wight* 2774, now in the Herbarium of the Berlin Museum. There is no indication on the sheet as to the locality except the Kew distribution label bearing the printed heading "Peninsula Indiae Orientalis," so that Schott's authority for citing the habitat as: "Carnatic, Malabaria," is not known to me. *Wight* 2773 in the Kew Herbarium, which contains this and another species of *Arisaema*, is from the Nilgiri Hills of S. India.

In De Candolle's Monogr. Phaner. **2**, 555 (1879), Engler united *A. Wightii* Schott with the earlier *A. Jacquemontii* Bl., a Himalayan plant. He did not cite Wight's specimen but mentioned *Hohenacker* 2164a from "Canara, Mangalor." In Pflanzenr. **4**, 23 F, 196–7 (1920), however, Engler reconsidered his verdict and separated the two species again. Under *A. Wightii* he there quoted *Wight* 2774 together with a sheet of W. A. Talbot as derived from "Mysore, Kadua" (misprint for Kadur); but it is only Talbot's sheet that is from Mysore. This specimen is in fruit and is, I consider, not *A. Wightii* but *A. Leschenaultii* Bl. *Hohenacker* 2164a, previously cited, was altogether omitted under all three of the above species, unless, indeed, the citation was misprinted under the last named as *Hohenacker* 20504. As far as I am aware the Hohenacker numbers

---

*Continued from *K.B.* 1932, 247.

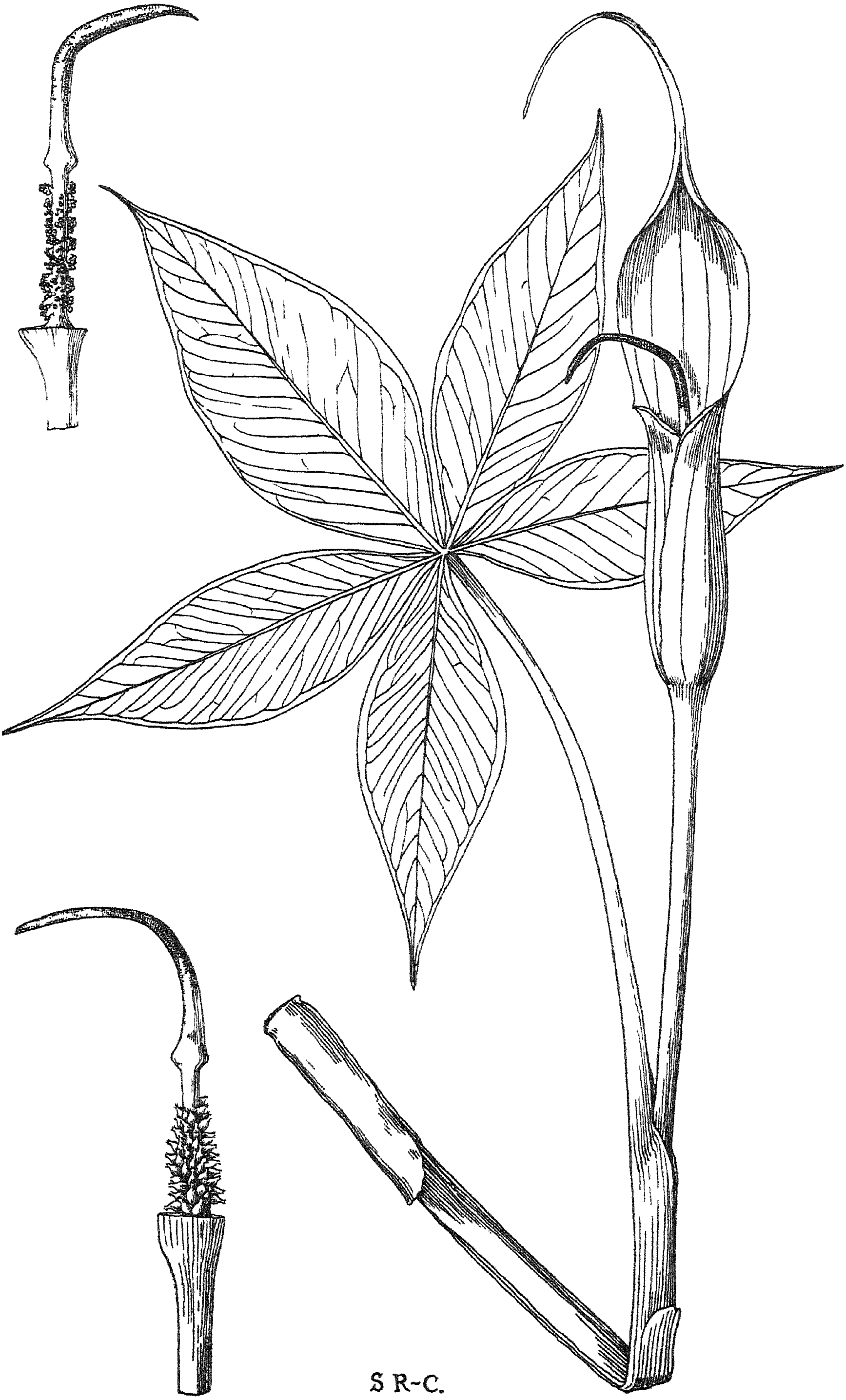
from S. India (collected for him by Metz) run to well below 6000, and as the next cited number is *Gamble* 20514, I think it is quite probable that 20504 is a slip for 2164a.

Professor E. Barnes of the Christian College, Madras, recently sent to Kew a number of specimens collected by him in the Nilgiri Hills, including a series of *Arisaema* most carefully and beautifully prepared, accompanied by photographs, notes and in two cases specimens in formalin. One of these is undoubtedly *A. Wightii* Schott, the others, as the collector himself points out, though allied, are distinct. These specimens have led me to revise the conception of *A. Wightii* that I had formed when working on the genus for the Flora of the Presidency of Madras, to separate out one new species which I had confused with *A. Wightii*, and to recognise two further new ones in the new material.

The material of *A. Wightii* as defined by me previously is all in a more or less dilapidated condition, hardly permitting a precise conception. From a scrutiny of the material now available and comparison with Wight's sheets (including the type, kindly lent by the Berlin Herbarium) and other sheets previously identified as this species, I have come to the conclusion that both Engler and myself confused two species and that the true *A. Wightii* Schott is confined to the Nilgiri Hills at elevations above 6000 ft. It is possible, however, if not probable, that further exploration will furnish specimens from the Anaimalai and Palni Hills. Further, I am inclined to think that Engler was right in combining *A. Wightii* Schott with *A. Jacquemontii* Bl. The absence of the plant from the areas between the Himalyas and the Nilgiri Hills does not invalidate this, since there is no region there of suitable climate and elevation. In contrast *A. tortuosum* Schott, being more accommodating, occurs in both ranges and also in intervening places at lower elevations. Nevertheless, not having seen the sheets of Jacquemont quoted by Blume, I do not at present propose to reunite them.

In view of this confusion and the rather meagre description given by Schott, I append an amplified description, based principally on Professor Barnes' excellent specimens. The three new species are also described below and the four may be distinguished as follows:

Limb of spathe expanded; leaflets 5–7:—
  Leaflets 5, sessile or only the middle one very shortly petiolulate; appendix abruptly swollen a little above the inflorescence......... *Wightii*
  Leaflets usually 7, sometimes 5, all distinctly petiolulate; appendix not abruptly swollen:—
    Limb of spathe dark-purple, tapering into a tail; spadix not recurved ....*Barnesii*
    Limb of spathe bright-green, suddenly narrowed into a tail; appendix recurved at the apex..........................*tylophora*
Limb of spathe cucullate; leaflets 9–11.......................*translucens*



S R-C.

Fig 1 *Arisaema Wightii* Schott × ¾

Arisaema Wightii *Schott* [Araceae-Aroideae].

Tuber subglobose, 1–1·3 cm. diam., flesh white. *Cataphylls* 3, lax, up to 24 cm. long, apex rounded, pale-greenish, almost white. *Petioles* 1–2, 27–48 cm. long, sheathing to above the middle, terete above, pale-green, mouth of sheath obliquely rounded; *segments* 5, radiate, elliptic-ovate to -obovate, acuminate, base acute, sessile or the median very shortly petiolulate, 2·4–10 cm. long, 1·2–5 cm. wide, primary nerves 8–12, arising at an angle of 45° from the midrib, 5–7 mm. apart, uniting in a submarginal vein 4–6 mm. from the entire margin with a more slender vein between, the nerves sometimes forked. *Peduncle* like the upper part of the petiole, usually shorter, sometimes longer, 24–49 cm. long. *Spathe* bright-green with 5 white vertical streaks and some fine white lines; tube nearly cylindric, 3–7 cm. long, about 1·2 cm. diam. in the middle, where it is widest, margin at mouth slightly revolute; limb ovate-boat-shaped, tapering into a curved filamentous appendage 6–9·5 cm. long, the apical half of which is almost black. *Spadix* dioecious, 7–8·8 cm. usually the ♀ longer than the ♂. ♀ *inflorescence* cylindric, 2·2–2·4 cm. long; *ovaries* crowded, pear-shaped, green with yellow streaks, 3 mm. long; *style* short, thick; *stigmas* minutely puberulous, surrounded by a black ring; *ovules* 4–5; *neuters* 0; *appendix* abruptly widened, sometimes truncately, at 5–8 mm. above the ovaries, then tapering to a long blunt point, white below, purple and recurved in the upper half. ♂ *inforescence* 2–3·3 cm. long, cylindric; *stamens* scattered, filaments thick, white, up to 1 mm. long; *anthers* broadly reniform, dark-purple, opening by an oblong slit; *neuters* 0; *appendix* like that of the ♀ but usually stouter, sometimes bent at a right angle and the tip more acute.

Wight 2774 without locality (type in the Berlin Herb.); Nilgiri Hills at Avalangy (Avalanche), about 7000 ft., fls. Oct., *Wight* 2773 (2 only out of 4 plants on the sheet); *Wight* without number or locality (in Kew Herb.), left hand plant only; Coonoor, fls. Sept., *G. King* without number; Shola in Hill West of Makurti Peak, 8000 ft., fls. June, *E. Barnes* AR.5.

Arisaema Barnesii *C. E. C. Fischer*, sp. nov. [Araceae-Aroideae]; *A. Wightii* Schott affine, sed minus, foliorum segmentis omnibus petiolulatis, spadice haud abrupte incrassata, appendice apice capitulata.

Tuber subglobose, 1–1·5 cm. diam. *Cataphylls* 3, lax, apex rounded, lowest short, becoming chaffy, uppermost up to 14 cm. long. *Leaf* solitary; *petiole* 20–40 cm. long, sheathing for about half its length, mouth of sheath oblique with 2 small rounded or subacute lobes; *segments* radiate, 5–7, distinctly petiolulate, elliptic-lanceolate, acuminate at both ends, 8–15 cm. long, 2·2–4·5 cm. wide, the lateral very slightly smaller, primary lateral nerves 9–18, 3–5 mm. apart, not very distinct from the secondaries, arising at an angle of 45° from the midrib, uniting in an intramarginal vein 2–3 mm. within the entire margins; petiolules 0·8–2 cm. long. *Peduncle*

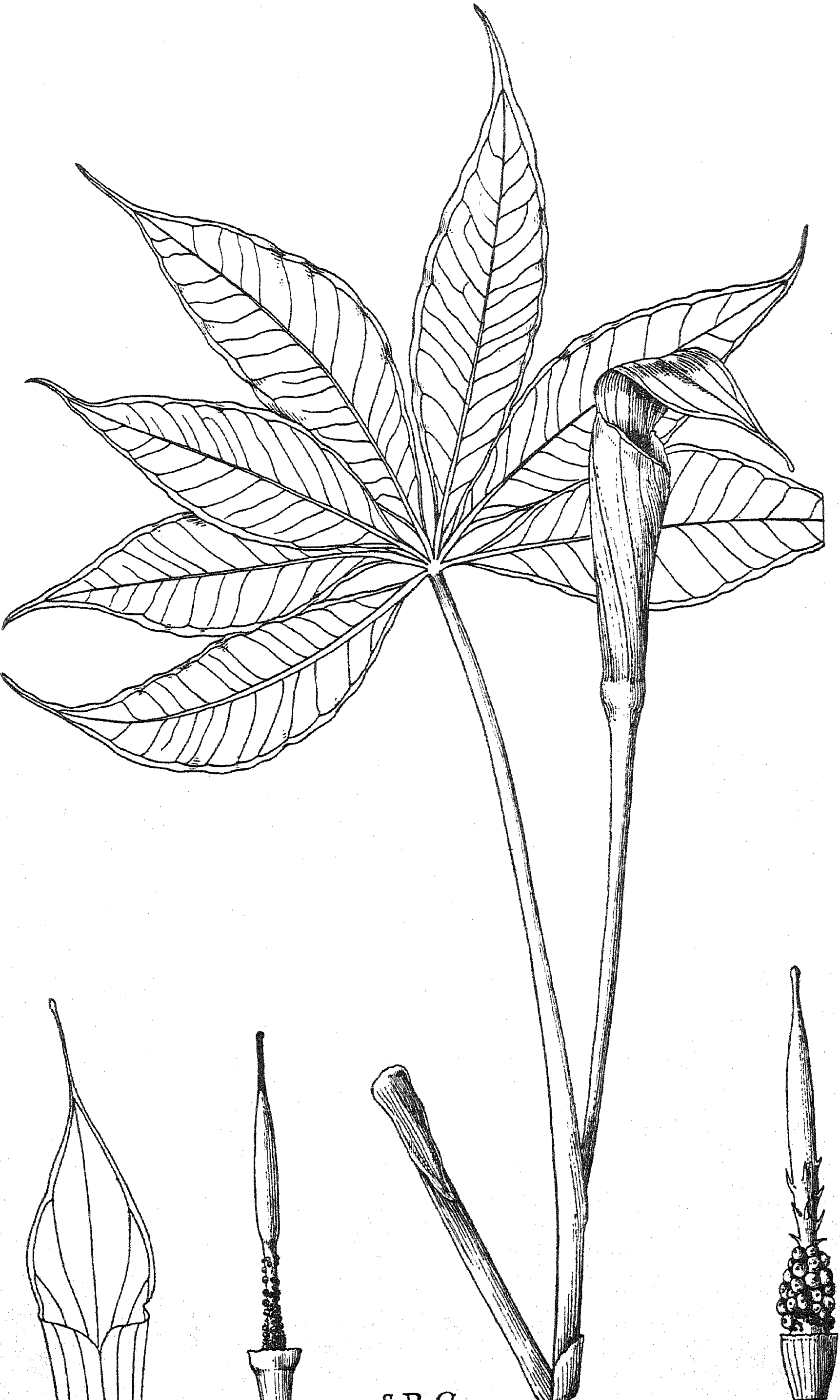


Fig. 2. *Arisaema Barnesii* C. E. C. Fischer. × ¾.

obcordate opening from the apex of which depends a filiform process 2·5–3 cm. long with an upcurved tip. *Spadix* 4–5·4 cm. long, dioecious, green with faint purple striae, the apical quarter white: ♂ inflorescence 2 cm. long, nearly cylindric; *stamens* scattered, *filaments* thick, up to 1·5 mm. long, *anthers* subglobose, purple, opening by an elliptic pore; *neuters* 0; *appendix* narrowly clavate, slightly narrowed and rounded at the apex; ♀ *inflorescence* 1–1·5 cm. long; *ovaries* crowded, subglobose, 1·5–2 mm. diam., *style* very short, *stigma* minutely papillose, *ovules* 4; *neuters* above the ♀ inflorescence, scattered, subulate, 5 mm. long, rarely with an anther (functional?) at the tip; *appendix* awl-shaped, apex blunt, sometimes much narrowed below the apex and again slightly widened at the tip.

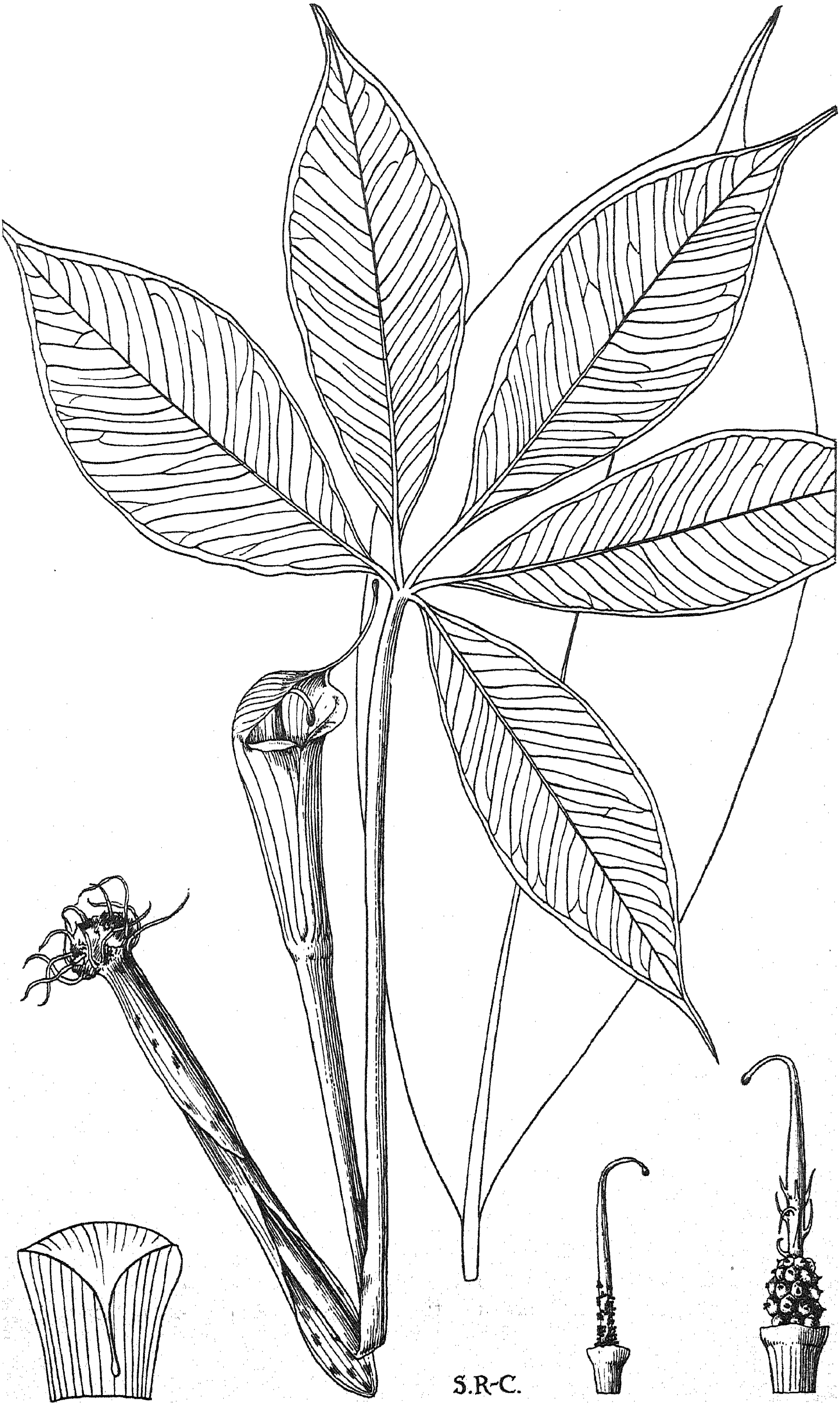
Nilgiri Hills: Carrington Tea Estate near Thia shola, 6000 ft., fls. June, *E. Barnes* AR.4.

Among the paintings in the Kew Herbarium is one drawn by the late Mrs. A. F. Broun at Travancore in 1929 which appears to be this plant, although the filiform appendage of the spathe is shown much longer and without an upturned tip.

Prof. Barnes writes of this species: " A very characteristic species. I found it on the edge of a shola about a mile south of Thia shola. *Biophytum polyphyllum* is also common there. At first I thought the plant was deformed, but we (my wife and I) soon found other similar ones. The purpose of the arrangement seems fairly obvious; flies of some kind attracted by the smell (not more noticeable than with other Arisaemas), settle on the thread-like appendage of the spathe. From this position they are attracted by the white end of the appendix of the spadix, which is clearly visible owing to the light that enters through the translucent parts of the spathe.

Arisema tylophorum *C. E. C. Fischer*, sp. nov. [Araceae-Aroideae]; *A. Barnesii* C. E. C. Fischer peraffine, sed spathae limbo claro-viridi abrupte-caudato, spadicis appendice recurvata differt.

Tuber spherical, 1 cm. diam.; producing bulbils; rootlets red. *Cataphylls* 3, lax, apex rounded, uppermost up to 13 cm. long, spotted with brown, becoming chaffy. *Leaf* solitary; *petiole* sheathing below the middle, light-green marbled with brown and pink, 19–26 cm. or more long; *segments* radiate, usually 7, sometimes 5, petiolulate, elliptic-lanceolate to elliptic-oblanceolate, acuminate or caudate-acuminate, base acute, 5·3–26 cm. long, 1·6–9 cm. wide, primary lateral nerves 8–17, 5–10 mm. apart, uniting at an angle of 45° with the midrib, uniting in an intramarginal vein 1·5–6 mm. from the erose margin, upper surface dark-green with a waxy lustre, lower bright green and very glossy; petiolules 1–1·8 cm. long. *Peduncle* slender, up to 18 cm. long, coloured as the petiole. *Tube of spathe* cylindric or very narrowly funnel-shaped, 2·5–4·5 cm. long, 1–1·2 cm. diam. at the mouth, white with vertical purple stripes within; *limb* bright-green, ovate, abruptly caudate, 1·5–2·5 cm. long, overarching, the filamentous tail 0·8–2 cm. long,


S.R-C.

upcurved at the apex and terminated by a distinct small spherical or clavate knob. *Spadix* dioecious or the ♀ with a few anthers among the ovaries; ♂ 4 cm. long, the floriferous portion elongate-conical, 1·2–1·7 cm. long, *stamens* scattered; *anthers* purple, spherical, sessile, opening by a pore; *neuters* 0; *appendix* nearly cylindrical, hardly thicker than the floral axis, narrowed and curved near the apex, terminating in a distinct, minutely-warted knob. ♀ *spadix* 5·5–6·5 cm. long, floriferous portion 0·8–2 cm. long; *ovaries* usually crowded, sometimes a little separated with a few anthers between, globose, green, 2 mm. diam.; *style* stout, 1 mm. long; *stigma* minutely papillose; *ovules* 4–6; *appendix* cylindric, hardly incrassate, beset below with subultae, rarely forked, neuters up to 6·5 mm. long, attenuate and recurved near the apex, terminating in a subclavate, minutely-warted knob.

Nilgiri Hills: Thaishola, 6000 ft., fls. June, *E. Barnes* AR.6 C, D, E (type in Kew Herb.); Gudarmalai, in wet shola, fls. May, *E. Barnes* AR.6 A, B; Avalanche bungalow, in wood, fls. April, *Viscount Gough* without number.

"This plant was found in flower in a shola about a mile from Naduvattam beyond the Cinchona Plantation, on 17.5.1932, and also on 20.6.1932, and was found to be very common in Thaishola, where many specimens were seen flowering on 16.6.1932. In both these sholas *A. Leschenaultii* Bl. also occurred and also what appeared to be a cross or intermediate form. The spathe had the coloration of the plant described above, but the shape of *A. Leschenaultii*, the appendage was club-shaped, the leaflets were like those described above but were sessile or nearly so" (Barnes).

In addition Professor Barnes has supplied the subjoined notes on two other species:

"AR 1. *Arisaema Leschenaultii* Bl. Very common in Longwood Shola, Kotagiri, flowering in June. A census of all plants seen was taken in respect to the following factors:—(*a*) sex, (*b*) number of leaflets, (*c*) whether left side of spathe overlapped the right, or vice versa. (Right means observer's right.) The following were the results:—

(*a*) 253 male, 28 female.
(*b*) *male* 2 with 5, 5 with 6, 96 with 7, 80 with 8, 50 with 9, 16 with 10, 4 with 11.
female 3 with 8, 6 with 9, 12 with 10, 4 with 11, 3 with 12.
(*c*) Right side over left, 7 females, 59 males.
Left side over right, 7 females, 45 males.

It is seen that the male plants are about nine times as numerous as females, that male plants mostly have 7, 8, or 9 leaflets, and females mostly have 10, and that half, or a little more, of the plants have the right edge of the spathe overlapping the left.

Female plants were generally larger than males, and were more numerous where conditions were more favourable. The largest male seen was 3 ft. 10 inches high; the largest plant seen was a female, and had the following measurements : *height* 5 ft. 2 in., *circumference* at least 3 in. from the ground, 6¼ in. (it grew in a stream-bed partly choked up with other plants and the bottom of the stem could not be reached), length of *spathe* 11 in., greatest width 3¼ in., *length of spadix* 6 in., *leaflets* 13 in. by 14 in. (12 leaflets).

One plant found had no leaf, but the spathe was divided into five. Several plants had two leaves, but this is rare.

There is a definite difference in colour of plants found in different parts of the Nilgiris. In Longwood Shola the colour of the spathe is green with white striations and some purple striations inside the tube ; the plants have a tall habit. In a shola on the Kundahs near Pirmund the spathe is dark purple-red with white striations and the plants are very squat with stout stem and spadix. Near Naduvattam the spathe colouration is yellow and white. There is also a great difference in shape of leaflets ; in some plants they are so broad that they overlap, while in others they are quite narrow ; some leaflets were very frilly, while others were flat.

AR 2 *Arisaema tortuosum* Schott. Fifty specimens that were flowering in Banagudi Shola (about 5500 ft.) near Aravenu, in the first week of June were examined. 26 were found to be male, and 24 monoecious.

Monoecious—2 leaves had 7 leaflets, 5 had 8, 32 had 9, 4 had 10, 4 had 11, 1 had 12. Each plant had 2 leaves.
12 had right edge of spathe over left, 3 had left over right, the rest were open so wide as not to overlap.

Males—5 leaves had 5 leaflets, 4 had 6, 37 had 7, 6 had 8. Each plant had 2 leaves. 10 had right edge of spathe over left, 3 left over right, and rest open.

It is seen that about equal numbers of plants are monoecious and male, that the average number of leaflets for monoecious plants is 9 and for males 7, and that generally the right edge of the spathe overlaps the left.

The largest specimen seen was monoecious, and was 3 ft. high. When the spathe withers after flowering it becomes almost white tinted with orange.''

Arthraxon depressus *Stapf* MS. sp. nov. [Gramineae-Andropogoneae]. *A. lanceolato* Hochst. proximus sed robustior, foliis rigidis latioribus, glumis majoribus edentatis differt.

An erect *herb*. *Roots* not seen. *Culms* slender, quite glabrous, leafy. *Leaf-sheaths* terete, tight, finely ribbed, glabrous, margins ciliate ; ligules thin, scarious, 2 mm. long, erose-truncate, glabrous or sparsely hairy ; blades rigid, narrowly lanceolate, to ovate or elliptic-oblong, acuminate or cuspidate, base cordate, 5–9 cm. long, 1–2·6 cm. wide, 9–15 nerved, glabrous except for short hairs scattered along the midrib below, margins minutely tubercled, often with stiff cilia from the tubercles. *Inflorescence* terminal, of 2–4 simple or branched peduncled spikes 2–5 cm. long ; peduncles long- or short-exserted, puberulous or pubescent, at least near the apex; partial peduncles slender, pubescent, 1–2 cm. long; joints of the rhachis slightly compressed, very little enlarged at the apex, 3·5–4·3 mm. long, long-ciliate; pedicels linear, flat, 2·2–3·5 mm. long, long-ciliate, devoid of glumes. *Spikelets* narrowly elliptic. *Callus* 0·07–0·08 mm. long, short-hairy. *Glumes* brown or olivaceous; the lower subcoriaceous, narrowly lanceolate, apex acute, minutely 2-toothed, 2-keeled with inflexed margins, back nearly flat, 5–6·8 mm. long, 6–7-nerved, nerves, especially the marginal, spinulose at least in the apical half; the upper chartaceous, deeply plicate-navicular, acuminate or mucronate, 5·4–7 mm. long, keel scaberulous towards the apex. *Lemmas* hyaline, plicate, sometimes brownish, margins ciliate; the lower 4·6–6·2 mm. long, epaleate and empty; the upper 4·2–5·6 mm. long, sometimes very shortly 2-lobed, bearing on the back just above the base a geniculate awn 10·7–12 mm. long, the longer part below the knee partly black, striate, glabrous, above slender, pale-brown, minutely ascendingly barbellate; palea hyaline, narrowly oblong, subacute, 2·5 mm. long. *Floret* ⚥, stamens 3, anthers 2·5–3·6 mm. long. *Grain* not seen.

Peninsula, precise locality not indicated, *Herb. Wight* 3372 (type in Kew Herb.); Mysore State, Agalatti, 3500 ft., Nov., *Meebold* 10545.

The narrowly lanceolate leaves and the shorter glumes are found in Meebold's specimen.

Arthraxon villosus *C. E. C. Fischer*, sp. nov. [Gramineae-Andropogoneae]; ab omnibus congeneribus spicularum sessilibus glumis inferioribus anguste alatis villosis recedit.

A slender *herb*. *Roots* not seen. *Culms* very slender, branched, glabrous except the sparingly hairy nodes. *Leaf-sheaths* lax, much shorter than the nodes, ribbed, sparsely hairy from minute tubercles, ciliate; ligules very short, membranous, truncate, ciliate; blades flaccid, lanceolate, acuminate, base subcordate, 3–4·5 cm. long, 1–1·5 cm. wide, softly hairy on both sides and ciliate, all the hairs from minute tubercles. *Racemes* 2, digitate, 2–2·5 cm. long; peduncles long or shortly exserted, glabrous; partial peduncles slender, angular, one very short with 1 or 2 solitary sessile spikelets differing from and larger than the rest, followed by a long joint, the other peduncle up to 1 cm. long; joints of the rhachis slender, depressed plano-convex, 3·5 mm. long, back 3-nerved, white villous, sides long white-ciliate. *Spikelets* 2-nate, except the 1–2 lowest, one sessile the other pedicelled; pedicels like the joints but wider and not nerved on the back. *Sessile spikelets* at the base very narrowly lanceolate; lower *glume* with a glabrous oblong callus 1 mm. long, narrowly linear-lanceolate, acuminate, 7–8 mm. long, 7-nerved, back subcoriaceous, slightly convex, margins widely hyaline, 3-keeled above the middle, keels hispidulous; upper glume plicate, acuminate, chartaceous, white with wide hyaline margins, keeled, glabrous; *lemmas* hyaline, plicate, acuminate, 4·3 mm. long, the upper bearing a geniculate awn 11–12 mm. long from a little above the base on the back, paleas 0, floret ☿. The remaining *sessile spikelets* linear-lanceolate ; *glumes* dissimilar, the lower with a semicircular hairy callus 0·6 mm. long, narrowly lanceolate, acuminate, 5·4–6 mm. long, 7-nerved, back slightly convex, subcoriaceous, densely villous, 2-keeled, the membranous, villous margins widely inflexed, keels narrowly winged, wings densely ciliate ; upper glume 4·7–5·3 mm. long, plicate, acuminate, white, thinly chartaceous with hyaline margins, keel and sides below the middle puberulous ; *lemmas* hyaline, epaleate, lower narrowly oblong, obtuse, 2·7–3·2 mm. long, empty, the upper plicate, acute or acuminate, 3–3·7 mm. long, bearing on the back from a little above the base a fine geniculate awn 11·5–13 mm. long, the shorter portion below the knee pale-brown, smooth, the upper portion darker, at least below, minutely ascendingly barbellate, its floret ☿, lodicules minute, stamens 2 or 3, anthers linear, 1·3–1·9 mm. long. *Grain* not seen. *Pedicelled spikelets* without callus ; *glumes* dissimilar, the lower ovate-lanceolate, acute, slightly convex, membranous, 6–8-nerved, 4–4·5 mm. long, pubescent, 2-keeled towards the apex, keels hispidulous ; upper glume thinly membranous, white, plicate, acute, 3-nerved, glabrous or sparsely ciliate ; *lemmas* hyaline 2·4–2·7 mm. long, narrowly oblong, epaleate, empty.

Bababudan Hills, April, *Sir A. G. and Lady Bourne* without number (type in Kew Herb.).

The single sheet has 3 separate sections of stem, all apparently from the same plant, but the lower part is lacking.

Dimeria bialata *C. E. C. Fischer*, sp. nov. [Gramineae-Andropogoneae] ; *D. pusillae* Thw. var. *Lawsoni* Hook. f. similis, sed rhachibus latioribus, glumis inferioribus alatis differt.

An annual *herb* ; culms slender 7–40 cm. high ; nodes 3–6, short at the base and increasing in length upwards, the uppermost often much exserted. *Leaves* erect, more or less densely beset with lax, spreading hairs from bulbous bases ; sheaths closely embracing the culm, finely striate ; blades linear, flat, sharply acute, nearly continuous with the sheaths, 2·5–7 cm. long, 2–5 mm. wide, midrib prominent below, continued into the sheath as a keel, lateral nerves 4, indistinct, margins revolute ; ligules membranous, semicircular or shortly oblong, glabrous. *Racemes* 2-nate, divaricate, 0·7–2·7 cm. long ; rhachis flat, 1 mm. wide, with a zig-zag blunt keel on the face, margins more or less densely ciliate ; internodes less than half as long as the upper glume ; pedicels short ; callus short, white hairy. *Spikelets* 10–30, oblong-lanceolate, wider than the rhachis. Lower *glume* linear-oblong, acute or acuminate, 3–4 mm. long, margins hyaline, keel narrowly winged and ciliate ; upper glume oblong-lanceolate, 3·4–4·2 cm. long, acuminate, margins hyaline and ciliate, keel broadly winged and ciliate, the wing rather corky. *Lemmas* hyaline ; lower spathulate, 1·5–2·5 mm. long, sparsely ciliate ;

upper 2·5–3·6 mm. long with a slender, geniculate awn 9–11 mm. long. *Anthers* 2, oblong, 1 mm. long.

S. Kanara District at Siradi, Nov., *A. Meebold* 10548 (type), 10752. "Abundant, predominant in places."

Ischaemum Rangacharianum *C. E. C. Fischer*, sp. nov. [Gramineae-Andropogoneae]; *I. semisagittato* Roxb. peraffine, sed foliis haud sagittatis, spicularum sessilium glumis inferioribus angustis nodulis marginalibus plus minus carinatis differt.

Perennial tufted *herb*. *Stem* erect or ascending from a prostrate, rooting base, 25–40 cm. high, leafy; nodes glabrous. *Leaf-sheaths* lax, ribbed, glabrous or more or less hairy along the margins and at the apex; ligules membranous, oblong, rounded, 1·5–4 mm. long, glabrous or pubescent; blades linear to linear-lanceolate, acuminate, base rounded or emarginate, sessile or petioled, 2–8·5 cm. long, 0·3–1 cm. wide, glabrous or more or less hairy on both faces, margins smooth or scaberulous; petioles 0–2·2 cm. long. *Peduncles* usually long-exserted, usually somewhat enlarged at the apex, glabrous. *Racemes* usually binate, rarely solitary, 2·5–7 cm. long; rhachis undulate; joints acutely trigonous in section or the outer angle blunt, enlarged to the 3-toothed apex, 3·7–4·8 mm. long, outer angle long hairy. *Spikelets* 2-nate, one sessile the other pedicelled; pedicels 1·8–2·5 mm. long, similar to the joints of the rhachis, separated from the lower glume by a groove. *Sessile spikelet*: *callus* turbinate, 1·2–2 mm. long, hairy below, separated from the glume by a groove; *lower glume* obliquely lanceolate, 4·6–6·5 mm. long, nearly flat, 2-keeled with narrowly inflexed nearly straight margins, basal portion stiffly chartaceous with 2–6 coriaceous, rather acutely ridged nodules on each margin, the back between smooth, apical part membranous, 5–7-nerved, the keels winged, wings broad on one side and narrow on the other, minutely ciliate, often purplish or reddish, the glume glabrous or minutely puberulous, sometimes with a few long hairs on the upper half; upper glume membranous, boat-shaped acuminate, strongly keeled, sometimes shortly cuspidate, 4·5–5·7 mm. long, minutely puberulous; *lemmas* hyaline, the lower narrowly lanceolate, acute, margins narrowly inflexed, its palea similar but with wider marginal flaps, containing two narrowly oblong to broadly obcuneate lodicules with truncate or lobulate apex and shortly produced outer angles and 3 stamens with linear anthers 3 mm. long; the upper lemma narrowly oblong or elliptic-lanceolate, 3·6–4·7 mm. long, 2-lobed for ½–¾ of its length, lobes acute, with a geniculate awn from the sinus, awn 1–1·7 cm. long, the portion below the knee shorter, compressed, dark, smooth, the upper part pale-brown, compressed below and setaceous at the apex, minutely barbellate, the palea lanceolate with widely inflexed margins, containing 2 lodicules similar to those of the lower floret, 3 stamens and a pistil; grain ellipsoid, slightly compressed, 2 mm. long, smooth, brown. *Pedicelled spikelet*: *lower glume* narrowly lanceolate sometimes oblique, acute, flat, chartaceous, 2-keeled, 4·6–6·7 mm.

long, glabrous or sparsely hairy, one keel with a wide wing, sometimes toothed at the apex, the other very narrowly winged at the apex, margins narrowly inflexed, sometimes with 1–4 marginal nodules on one or both sides below the middle; *upper glume* similar to that of the sessile spikelet, 3·5–5·3 mm. long; *lemmas* hyaline, the lower similar in all respects to that of the sessile spikelet, the upper boat-shaped, acuminate and sometimes shortly aristate, keeled, margins with wide flaps at the apex and narrower below; 2·8–3·7 mm. long, the palea shorter, linear-lanceolate with inflexed margins, containing lodicules and a pistil and sometimes anthers as in the sessile spikelet.

Malabar District: Shoranur, Nov., *K. Ranga Achariyar* (type in Kew Herb.); Pudupadi, Nov., *K. Ranga Achariyar*; Melarkode, Dec., *Madras Herb.* 16356. Travancore: Courtallam, Dec., *M. Rama Rao's* Collector 2104; " Beyond Varkalay Bridge," Nov., *Madras Herb.*; " On the way from Kulathurpuzha to Rockwood Estate," *K. Venkoba* 4102, 4104; without precise locality, *V. Narayanaswami* 1743.

Fig. 130 of *Ischaemum aristatum* K. Ranga Achariyar non Linn. in K. Ranga Achariyar's " Handbook of Some South Indian Grasses " appears to have been drawn from the type sheet or that from Pudupadi.

Ischaemum travancorense *Stapf MS.* sp. nov. [Gramineae-Andropogoneae]; *I. magno* Rendle affine, foliis glabris, petiolis tomentosis, lemmate superiore spicularum sessilium profunde 2-lobato differt.

A perennial *herb. Culms* subrobust, erect or ascending, up to 80 cm. high; nodes glabrous. *Leaf-sheaths* terete, smooth, the lower somewhat inflated and longer than the internodes, the upper close and shorter than the internode; ligules scarious, subacute or rounded, up to 4 mm. long; blades narrowly lanceolate, acute or acuminate, base rounded, often contracted into a very short tomentose petiole, margins spinulose-scabrid, otherwise glabrous. *Racemes* terminal, spiciform, 2-nate; peduncles shortly or considerably exserted, rigid, erect; rhachis slightly undulate; joints stout, obtusely trigonous in section, 3–6 mm. long, hollow, glabrous or sparsely ciliate on the back; pedicels 2·5–3 mm. long, similar to the joints, sometimes curved. *Sessile spikelet*: *callus* semi-annular, confluent with the bases of the joint and pedicel, 0·5–0·7 mm. long, glabrous or sparsely hairy; *lower glume* oblong, acute, 4·5–6 mm. long, 2 mm. wide, the basal ⅔ coriaceous with 2–6 marginal nodules on either side, the disc between smooth or shallowly transversely rugose, the apical ⅓ chartaceous, darker, 2-keeled with narrowly inflexed margins, often one or both keels narrowly winged; *upper glume* boat-shaped, acute, acutely-keeled, as long as the lower glume; *lemmas* hyaline, the lower lanceolate, acute, with narrowly inflexed margins, 4–5 mm. long, containing 3 stamens with linear anthers 3 mm. long, the upper narrowly oblong, 3·5–4·5 mm. long, acutely 2-lobed for about half its length, with a geniculate awn up to 1 cm. long from the sinus, sometimes the awn not exceeding the lobes or even absent, the palea linear-oblong with widely inflexed margins, containing 3 stamens and a pistil. *Pedicelled spikelet*: *lower glume* oblong-lanceolate, often oblique, acute, 4–7 mm. long, 3 mm. wide, subcoriaceous, pale, smooth or rugulose towards the base, 2-keeled with narrowly inflexed margins, the exterior keel with a broad wing, the other narrowly winged; *upper glume* and *lower lemma* similar to those of the sessile spikelet; *upper lemma* hyaline, lanceolate, acute, entire, margins inflexed, 3·5–5 mm. long, its palea linear-lanceolate with widely inflexed margins, containing 3 stamens and a pistil.

Travancore: Alleppy in backwaters, Dec., *M. A. Lawson* 130 (type in Kew Herb.); Kumaragam near Kottayam, aquatic, *K. Venkoba Rao* 4070. Wynaad: Mudumallai, without number or collector's name (probably a *Beddome* specimen), in Kew Herb.

Ischaemum corollatum *Nees* ap Steud. Synops. 369, has been placed among the "doubtful species" by both Hackel (Monogr. Phan. **6**, 252) and Hooker (Fl. Brit. Ind. **7**, 139). Having seen the type sheet (*Royle* 264) I find that it is identical with *Phacelurus speciosus* (Nees) C. E. Hubbard (=*Andropogon speciosus* Nees ap Steud Synops. **1**, 375), the type of which (*Royle* 263) is also in the Berlin Herbarium. In the first-named specimen the pseudospike is solitary and in the latter there are four.

Rottboellia divergens *Hack.* was described in De Candolle's Monogr. Phanerog. **6**, 292 from a plant collected by Huegel, which is now in the Royal Museum at Vienna. The locality of collection is cited as "Asia (versimiliter India or.)."

Lisboa in the Journ. Bomb. Nat. Hist. Soc. **6**, 195 (1891), referred a plant collected by himself at Mahableshwar to this species, but expressed his doubts of the correctness of the determination. In the Fl. Brit. Ind. **7**, 155 (1897), Lisboa's as well as some plants collected by Ritchie are referred to this species and the habitat is given as: "East Indies, *Huegel.* The Concan and Canara; Belgaum, *Ritchie*; Satara and Mahableshwar, *Lisboa.*"

By the courtesy of the Director of the Vienna Museum I have been able to compare Lisboa's and Ritchie's plants and some further material collected by Meebold with the type specimen and find that none of them agrees with it. These specimens, therefore, represent a distinct species.

R. divergens is described as having the lower glume of the sessile spikelet "cancellato-foveolata" on the back. These pits are due to the crossing of deep longitudinal grooves by very narrow transverse laminae or lines of papillae. The specimens quoted above are distinguished by the corresponding glumes being furnished with hooked spinules and long awns.

As shown by O. Kuntze, the section of the genus *Rottboellia* to which the species in question belongs should be segregated under the generic name *Manisuris* Linn. f.

As Lisboa's, Ritchie's and Meebold's plants are not *M. divergens* (Hack.) O. Ktze., a new specific name must be provided for them, and I propose *forficulata* in view of the resemblance of the lower glume of the sessile spikelet to a pair of shears.

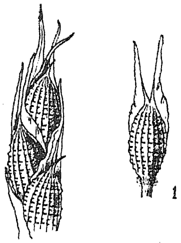


Fig. 5. *Manisuris divergens* (Hack.) O. Ktze. Lower glume of sessile spikelet. ×4.

Since the closely allied species *M. acuminata* (Hack.) O. Ktze. and *M. Talboti* (Hook. f.) both come from the Bombay Ghats and coast, it is probable that Huegel collected his specimen in the hills East of Bombay on his way to the Himalayas.

As the material of *M. forficulata* previously available was scanty, an amplified description based on all the material seen by me is appended.

Manisuris forficulata *C. E. C. Fischer*, nom. nov. [Gramineae-Andropogoneae]; *M. divergens* (Hack.) O. Ktze. affinis, sed spicularum sessilium glumis inferioribus marginibus spinulosis differt.

Annual *herb*. *Culms* tufted, very slender, 6·25 cm. high, terete, slightly enlarged below the racemes, glabrous or more usually softly subappressed-hairy; nodes 2–3, glabrous, marked by a dark-coloured (when dry) constriction. *Leaves* basal and cauline, hirsute with fine hairs from minute tubercules; sheaths lax, compressed, striate; ligules membranous, rounded, short, glabrous or ciliate; blades narrowly linear, conduplicate or flat, finely acuminate, 4–12 cm. long, 1–5 mm. wide. *Racemes* terminal, solitary, spiciform, 2–6 cm. long; *joints* of the rhachis 2·5–3·3 mm. long, subclavate usually glabrous, sometimes minutely puberulous, especially on the margins, the apex truncate or slightly emarginate, the outer angle, at least, ciliate or with a tuft of long hairs, disarticulating and falling off together with both spikelets. *Spikelets* appressed to the rhachis, straw-coloured or pale-brown, the upper part and awns sometimes purple-tinted. *Sessile spikelet* with a very short transversely oblong or subrhomboid, glabrous callus; *lower glume* coriaceous, lanceolate or oblong-lanceolate, acute, 2·6–3 mm. long (excluding the awns), terminating in two diverging, ascendingly barbellate, often unequal, awns 5·5–6·7 mm. long, glabrous or minutely puberulous, the lower

$\frac{1}{2}$–$\frac{2}{3}$ of the back convex, 4–5-nerved and usually 4–6, grooved, with 5–9 marginal spinules often as long as the glume is wide, with ciliate tips bent forwards at nearly right angles, the disk smooth or with a few similar spinules in the middle or the marginal spinules connected by regular rows of spinules, sometimes, again, the spinules fused together into continuous or discontinuous crenelated and ciliate laminae, the upper portion of the back flat with narrowly inflexed, winged margins, the wings membranous, more or less crescent shaped and continued onto the basal part of the awns, their margins minutely ciliate; *upper glume* chartaceous or membranous, lanceolate or elliptic-lanceolate, acuminate, convex, 2·5–3·2 mm. long, glabrous or minutely puberulous, margins inflexed; *lemmas* hyaline, lanceolate, margins ciliolate, the paleae shorter, the lower lemma 2·5–3 mm. long, empty, the upper 2·2–2·5 mm. long, containing a bisexual flower; *lodicules* minute; *stamens* 3, anthers linear; 0·8 mm. long; *grain* ellipsoid, compressed, brown, smooth, 1·3–1·6 mm. long, embryo $\frac{1}{2}$–$\frac{2}{3}$ as long. *Pedicelled spikelet* with a *pedicel* similar to and completely fused with the joint of the rhachis, as long or rather shorter, apex not ciliate; *glumes* chartaceous or subcoriaceous, glabrous or puberulous, the lower lanceolate to ovate, acute, convex, 2·4–3·5 mm. long with a terminal, ascendingly barbellate awn 6·8–10·7 mm. long, 5–9-nerved, one margin broadly winged, occasionally wingless, the wing continued onto the lower part of the awn, its margin ciliolate; the *upper glume* boat-shaped, acute, 2·4–3·2 mm. long, terminated by a slender, often curved arista, 2·5–4·5 mm. long, the keel winged above, wing oblong, continued onto the lower half of the arista or higher, its margin entire, truncate, rounded or with two large teeth at the apex, ciliolate; *lemmas* sometimes absent, if present hyaline, paleate or not, empty.

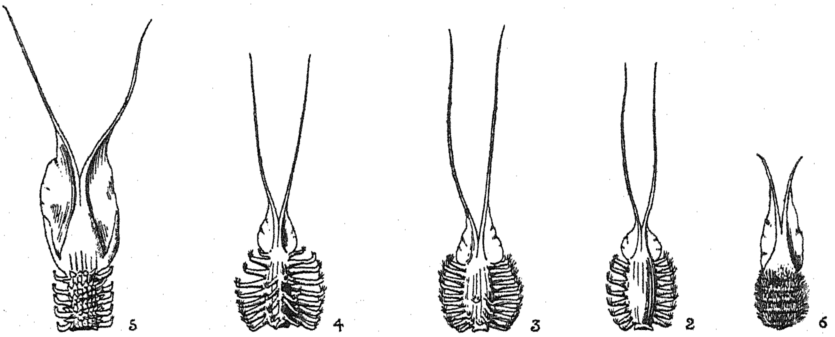


Fig. 6. *Manisuris forficulata* C. E. C. Fischer (nos. 2–5), and *M. forficulata* var. *hirsuta* C. E. C. Fischer (no. 6). Lower glumes of sessile spikelets. × 4.

Bombay Presidency, Mahableshwar, Sept., *Dr. J. C. Lisboa*, without number (type in Kew Herb.); Belgaum, *Dr. Ritchie* 808, 827; Khandala, Sept., *A. Meebold* 8850, "on sheet rock"; N. Kanara at Castle Rock, Oct., *A. Meebold* 10558; Belgaum District, Amboli Ghat, Oct., *W. A. Talbot* 4305. Cochin State at Kavalay, 3000–4000 ft., Nov., *A. Meebold* 13331.

var. **hirsuta** *C. E. C. Fischer*, var. nov.; a typo nodis, pedicellis glumisque inferioribus generaliter dense hirsutis, spicularum sessilium glumarum inferiorum spinulis minoribus plus minusve indumento celatis, aristis curtioribus interdum glumis minoribus, spicularum pedicellatarum glumis superioribus cuspidatis, haud aristatis, ala cuspis apicem superante differt.

S. India: Bababudan Hills at Kalhatti, 6000 ft., Nov., *A. Meebold* 10559.

XLII—RESEARCHES ON SILENE MARITIMA AND S. VULGARIS*† : XI. E. M. MARSDEN-JONES AND W. B. TURRILL.

GENETICS OF PETAL SIZE AND OF OTHER CHARACTERS IN S. MARITIMA.

The experiments recorded in this paper were carried out in order to investigate the genetics of petal size. All the material was of known wild origin and the parental stock-plants are fully described in the third paper of this series (*Kew Bull.* No. 5, 1929). The stock-plant 13, which is the most important subject of the experiments here considered, is unique in our collections in having very poorly developed petals which scarcely project beyond the calyx. The corolla is thus markedly contrasted with ordinary *S. maritima* corollas as exemplified in stock-plants 2 and 5.

Selfings.

N. 14. S.-P. 5 was selfed and produced a generation of 40 plants. The generation was uniform and like the parent in habit, leaves, inflorescence, calyx, corona, presence of anthocyanin blotch, filaments, stigmata, immature seeds, and capsules. All plants produced fully developed petals and hermaphrodite flowers.

N. 16. S.-P. 13 was selfed and produced a generation of 59 plants. The generation was uniform and like the parent in habit, leaves, inflorescence, calyx, corona, absence of blotch, anthers, filaments, stigmata, and immature seeds. All plants produced poorly developed petals. One plant had some flowers with normal sized petals in addition to flowers with poorly developed petals.

---

*Continued from *K.B.* 1932, 394.

† As a footnote to the first paper of this series (*Kew Bull.* 1928, 1) we pointed out that we agreed with the arguments, as at that time presented, of our colleague, Dr. T. A. Sprague, in favour of the name *Silene vulgaris* (Moench) Garcke for the common bladder campion. In a paper published in *Kew Bull.*, 1933, 151, evidence has now (i.e. since the Cambridge International Botanical Congress) been advanced in favour of the name *S. Cucubalus* Wibel. As, however, it seems undesirable to change a name in the middle of a series of papers which are being published under one general title, we have decided to retain the name *S. vulgaris*. If *S. maritima* and *S. vulgaris* are combined in one species, as is done by some authors, the former name is apparently the correct one for the composite species.

Two plants deserve special mention. One plant had some open flowers with petals somewhat larger than the poorly developed petals of other plants of the generation and, in addition, flowers most of which failed to open, the calyx teeth remaining connivent and the flowers sterile, though in a few of these the stigmata projected. The second plant was still more extreme, most of the flowers remaining with enclosed petals and stamens but with protruding stigmata.

Crossings.

The following crossings were made:

N. 34. S.-P. 5×S.-P. 13 (F_1).
N. 69. N. 34, Plant 26 selfed (F_2).
N. 36. S.-P. 2×S.-P. 13 (F_1).
N. 68. N. 36, Plant 1 selfed (F_2).

N. 34. 50 plants in generation.

Habit uniform and as S.-P. 5; stems up to 3·5 dm. long, with some anthocyanin.

Leaves intermediate between those of the parents for shape and colour.

Inflorescence with from 3 to 7 flowers, erect and actinomorphic.

Calyx with much anthocyanin, narrow-cylindric.

Corolla with full-sized petals, petals and segments not overlapping, $\frac{3}{4}$ lobed, bilobed. In 34 plants blotch present, in 16 plants blotch absent. In 41 plants full-sized scale, in 8 plants small scale, in 1 plant boss.

Androecium: all plants with purple anthers and pink filaments and all had hermaphrodite flowers.

Gynaeceum of all flowers with stigmata pink and immature seeds pink.

Seeds of all plants armadillo.

Plant 26 had the following characters: blotch present and full sized scale.

N. 69. 25 plants in generation.

Habit of all plants prostrate; stems up to 3·2 dm. long, with much anthocyanin.

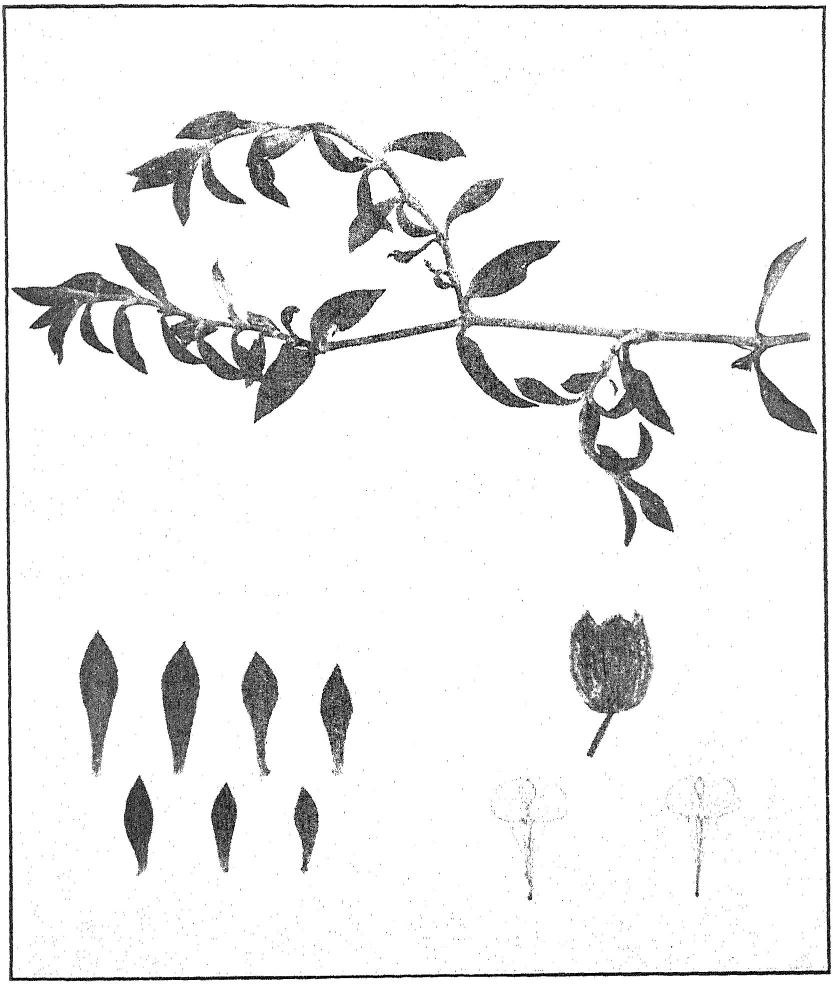
Leaves of 16 plants narrow as in S.-P. 5, of 9 plants intermediate as in immediate parent; 23 with some anthocyanin, 2 with much anthocyanin.

Inflorescence with from 1 to 5 flowers, erect and actinomorphic.

Calyx with much anthocyanin; of 9 plants narrow-ellipsoid, of 16 plants, narrow-cylindric.

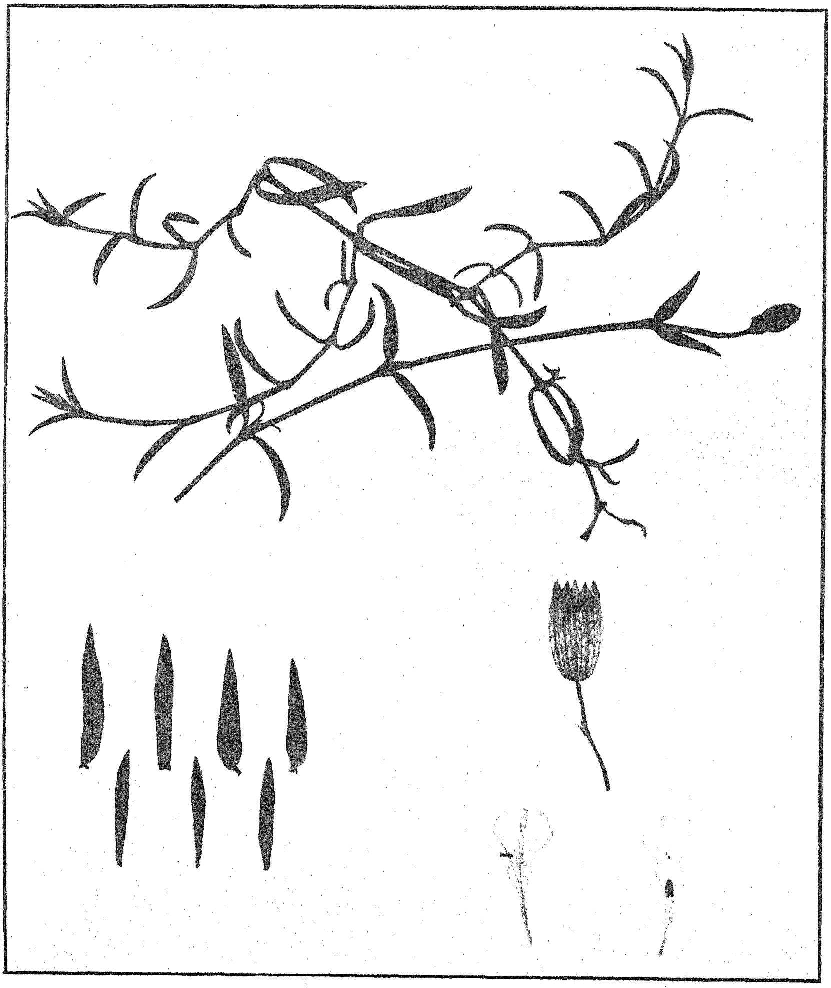
Corolla: in 17 plants petals full-sized, in 8 poorly developed; in 5 plants petals overlapping, in 20 plants petals not overlapping; in 4 plants segments overlapping, in 21 plants not overlapping; in all plants $\frac{3}{4}$ lobed; in all plants bilobed; in 16 plants blotch present, in 9 plants blotch absent; in 14 plants good scale, in 9 plants small scale, in 1 plant boss to very small scale, in 1 plant boss.

PLATE XIV



Silene maritima, stock-plant A2, Tilly Whin, Swanage, 1923.

PLATE XV



Silene maritima, stock-plant A5, Chesil Beach, Portland end, 1926.

Androecium: all plants had hermaphrodite flowers; in 21 (or 20) plants filaments pink, in 4 (or 5) plants filaments white; in all plants anthers purple.

Gynaeceum: in 21 plants stigmata pink, in 4 plants white; immature seeds of all plants pink.

Seeds of all plants armadillo.

N. 36. 44 plants in generation.

Habit as in parents, stems up to 3·2 dm. long, with a trace of anthocyanin.

Leaves as in parents.

Inflorescence with from 3 to 7 flowers, erect and actinomorphic.

Calyx with much anthocyanin; shape ranged from narrow-cylindric to broadly ellipsoid and showed considerable variation even on one plant.

Corolla with full-sized petals, petals and segments overlapping in 43 plants, petals overlapping and segments not overlapping in 1 plant, all ¾ lobed and bilobed. In 12 plants blotch present, in 32 plants blotch absent. In all plants good scale.

Androecium: 26 plants with only hermaphrodite flowers; 7 plants with only female flowers; 11 plants with both hermaphrodite and female flowers. All plants with anthers had these purple. 19 plants had pink filaments; 18 plants had white filaments.

Gynaeceum: of 29 plants stigmata pink; of 15 plants stigmata white. All plants had pink immature seeds.

Seeds of all plants armadillo.

Plant 1 had the following characters: calyx narrow-ellipsoid; petals and segments overlapping, blotch present; hermaphrodite; filaments white; stigmata white.

N. 68. 59 plants in generation.

Habit uniform and as immediate parent; stems up to 3 dm. long, with a trace of anthocyanin.

Leaves as in immediate parent.

Inflorescence as in immediate parent.

Calyx: in 48 plants as in immediate parent, in 11 plants narrow-cylindric.

Corolla: in 46 plants petals full-sized, in 13 poorly developed; in 23 plants petals overlapping, in 36 plants petals not overlapping; in 20 segments overlapping, in 39 segments not overlapping; in 45 plants ¾ lobed, in 14 plants ⅔ lobed; in 13 plants multilobed, in 46 bilobed; in 21 blotch present, in 38 blotch absent; in 57 good scale, in 2 small scale.

Androecium: 37 plants had only hermaphrodite flowers, 10 had female flowers only, and 12 some flowers hermaphrodite some female; all plants with stamens had white filaments and purple anthers.

Gynaeceum of all flowers with white stigmata and pink seeds.

Seeds of all plants armadillo.

Conclusions.

Petal development.

S.-P. 13 had poorly developed petals and bred true for this character. S.-P. 2 and S.-P. 5 bred true for fully developed petals. In the crosses N.34 and N.36, S.-P. 13 was used as the pollen parent on S.-.P. 5 and S.-.P. 2 respectively, each of which had fully developed petals. Both F_1 generations had full-sized petals. In F_2 the following ratios were obtained:

N. 69, 17 full-sized : 8 poorly developed petals.
N. 68, 46 ,, 13 ,, ,, ,,
Totals 63 ,, 21 ,, ,, ,,

We suggest that these figures represent a monohybrid 3 to 1 ratio.

Habit.

All the plants had the prostrate habit of *S. maritima*.

Leaves.

S.-P. 13 and S.-P. 5 bred true for their respective leaf-shapes. Their F_1 was intermediate, but only the narrow (S.-P. 5) and intermediate (F_1) shapes reappeared in F_2 in the ratio 16 : 9. We know from many crosses that narrowness of leaf is a very prepotent factor in *Silene* crosses. In N. 36 and N. 68 the leaf-character remained as in the original parents.

Calyx.

S.-P. 13 and S.-P. 5 bred true for their respective shapes, F_1 gave all narrow-cylindric (as S.-P. 5), F_2 gave narrow-cylindric : narrow-ellipsoid : : 16 : 9. In N. 36 the calyx shapes proved scarcely scorable, in the F_2 the plants were scored as 48 narrow-ellipsoid : 11 narrow-cylindric.

Corona.

All parents had scales, but these were poorly developed in S.-P. 13. In N. 34 the ratio obtained was 41 scale : 8 small scale : 1 boss, and in N.69 (from selfing a plant with a scale) 14 scale : 10 (9) small scale : 1 (2) boss. In N. 36 all plants had scales but in N. 68 the ratio was 57 scale : 2 small scale; of the 57 with at least fairly well-developed scales 7 had particularly well-developed scales. The factor for poorly developed petals undoubtedly influences scale development, though in a manner not statistically determined, and is, at least partly, responsible for the above ratios.

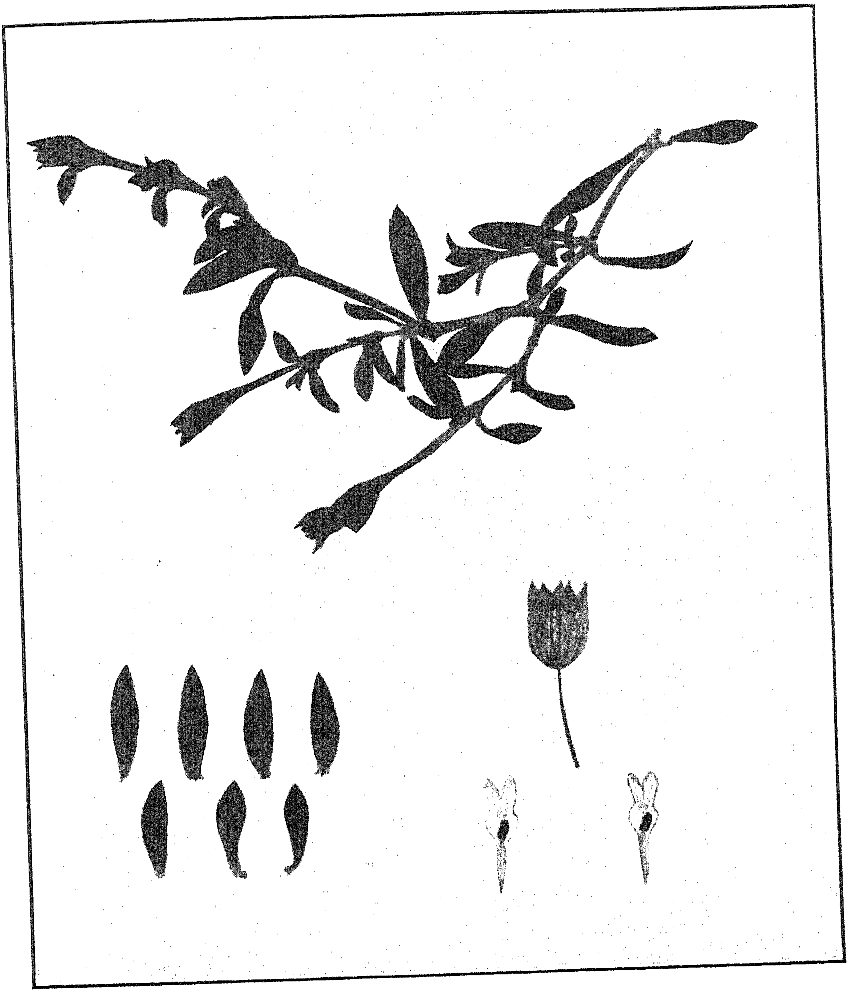
Lobing of petals.

Multilobing appeared only in N. 68 (an F_2 generation), in the ratio 13 multilobed : 46 bilobed. Consideration of the genetics of lobing is reserved for a future paper in this series.

Depth of petal lobing.

S.-P. 13, its selfed offspring S.-P. 5, and the F_1 (N. 34) had $\frac{3}{4}$ lobing as had all plants of the F_2 (N. 69). S.-P. 2 and the F_1 (N. 36) had also $\frac{3}{4}$ lobing, and S.-P. 2 was homozygous for this character (see *Kew Bull.* 1928, 12), but the F_2 (N. 68) gave 45 with $\frac{3}{4}$: 14 with $\frac{2}{3}$. There is a high correlation in N. 68 between poorly

PLATE XVI



Silene maritima, stock-plant A13, Chesil Beach, eastern portion, near the roadside, 1926.

developed petals and ⅔ lobing, 11 of the plants with ⅔ lobing having poorly developed petals. Some factor influence brought in from S.-P. 2, presumably in a heterozygous condition, appears to be responsible for the F_2 (N. 68) ratio.

Blotch on petals.

S.-P. 13 and its selfed offspring had no blotch, S.-P. 5 had a blotch. The F_1 (N. 34) gave 34 blotch : 16 no blotch. The immediate parent of F_2 (Plant 26 of F_1) had a blotch and on selfing gave 16 blotch : 9 no blotch.

In N. 36 the ratio was 12 blotch : 32 no blotch and the immediate parent of the F_2 (Plant 1 of N. 36) had a blotch and on selfing gave 21 blotch : 38 no blotch. We did not score S.-P. 2 for blotch but assume that it had a blotch and was heterozygous for blotch—no blotch. The plant is now dead. The F_2 ratios are reversed—16 : 9 and 21 : 38. These results may be compared with those obtained for anthocyanin development in other organs (see *Kew Bull.* 1932, 236–238).

Overlapping of petals and segments.

In S.-P. 13 and its selfed offspring, and in F_1 (N. 34) petals and segments did not overlap. S.-P. 5 had not overlapping petals but contiguous segments. In F_2 (N. 69) the results were :

petals overlapping 5 : not overlapping 20.
segments ,, 4 : ,, ,, 21

S.-P. 2 had petals and segments contiguous. In F_1 (N. 36) all plants had overlapping petals and all except one overlapping segments. In F_2 (N. 68) the results were :

petals overlapping 23 : petals not overlapping 36
segments ,, 20 : segments ,, ,, 39

Absence of overlapping is here largely due to the influence of the poorly developed petal character, since, owing to the small size of the petal lamina, neither petals nor segments can normally overlap in a flower with poorly developed petals. At the same time there are other independent factors controlling overlapping or not overlapping of petals and segments.

Androecium.

All three stock plants, the selfed generation, and both F_1 and F_2 generations had purple anthers. S.-P. 13 and the selfed generation had white filaments. S.-P. 5, its selfed generation, and the F_1 (N. 34) had pink filaments. The F_2 (S.-P. 69) showed segregation in the ratio 21 (20) pink : 4 (5) white. S.-P. 2 had pink filaments and the F_1 (N. 36) segregated in the ratio 19 pink : 18 white. The immediate parent of the F_2 and the whole F_2 generation had white filaments. It is evident that pink is dominant to white, this latter being a pure recessive. Stock plants 13 and 5 were homozygous for white and pink respectively and S.-P. 2 heterozygous. The F_2 ratio of N.69 is 5 : 1 ; the F_1 ratio of N. 56 is 1 : 1.

S.-P. 13 and S.-P. 5 were fully hermaphrodite. S.-P. 2 was mainly female, but various flowers contained from 1 to 10 stamens (see *Kew Bull.* 1928, pp. 4–6). The selfing of S.-P. 13, the F_1 of this with S.-P. 5 and the F_2 had all hermaphrodite flowers. In the F_1 and F_2 (from a ☿) of S.-P. 13 with S.-P. 2 (N. 36) the ratios were :

F_1 26 ☿ : 7 ♀ : 11 ☿ and ♀
F_2 37 ☿ : 10 ♀ : 12 ☿ and ♀

The occurrence of purely female plants, approximately in 5 : 1 ratios, is undoubtedly due to the influence of S.-P. 2.

Gynaeceum.

S.-P. 13 and its selfed generation had white stigmata. S.-P. 5, its selfed generation, and the F_1 (N. 34) plants all had pink stigmata. The F_2 generation (N. 69) segregated in the ratio 21 pink : 4 white. S.-P. 2 had pink stigmata and the F_1 (N. 36) segregated in the ratio 29 pink : 15 white. The immediate parent of the F_2 generation (Plant 1) and all plants of the F_2 had white stigmata. It is evident that pink is dominant to white, this latter being a pure recessive. Stock-plants 13 and 5 were homozygous for white and pink respectively and S.-P. 2 heterozygous. The F_2 ratio of N.69 is 5 : 1 ; the F_1 ratio of N. 36 is 2 : 1.

In all stock-plants, in all plants of the selfed, F_1, and F_2 generations the immature seeds were pink.

Seeds. In all stock-plants, in all plants of the selfed, F_1, and F_2 generations the mature seeds were armadillo.

Summary.

1. An account is given of selfing a plant with poorly developed petals and of crossing it with each of two other stock-plants having normal petals. The character pair shows a monohybrid genetic basis in its inheritance, segregating in F_2 in a ratio of 3 fully developed : 1 poorly developed petals.

2. Scorings were made of habit, leaf shape, calyx shape, corona development, lobing of petals, depth of petal lobing, presence or absence of blotch on petals, overlapping of petals and segments, colour of anthers, filaments, stigmata, and immature seeds, sex, and testa patterns of mature seeds. The figures obtained for these characters are discussed.

The research on which this paper is based has been aided by a Royal Society Government grant.

XLIII—THE DATES OF HOOKER'S "COMPANION TO THE BOTANICAL MAGAZINE." T. A. SPRAGUE.

The work consists of two volumes bearing the dates 1835 and 1836 respectively on their title pages. Actually it was issued in 24 monthly parts from Aug. 1835 to July 1837, together with the corresponding numbers of Curtis's Botanical Magazine. This information and the dates of publication given below have been obtained from the advertisements on an incomplete set of Botanical Magazine wrappers in the Library of the Kew Herbarium. On the last page of the wrapper for July 1, 1835, there is an advertisement of the Companion to the Botanical Magazine, stating that the first number will be issued with the August number of the Botanical Magazine. On the wrapper for Aug. 1, 1835, it is stated that " the first Number [of the Companion] appears with the present Number of the Botanical Magazine." Similarly we learn that the second number appeared on Sept 1, 1835, the sixth on Jan. 1, 1836, the eighth on March 1, 1836,* and the twenty-fourth number on July 1, 1837, after which the work was discontinued.

It is stated in the advertisement of the " Companion " that " A Number, consisting of two sheets of closely printed pages, accompanied by two plates, partially coloured, will appear every month, price 1s. 6d.; or if taken stitched with the Magazine, only 1s." By a curious mistake each volume was estimated to consist of nearly 450 pages instead of nearly 400 (384), and this miscalculation was repeated in each advertisement of the work.

Actually, only nineteen plates were issued with the first twelve numbers, instead of the twenty-four promised, but four of them (III, VIII, XI, XVI), were double plates, the total being equivalent to twenty-three single plates. In the second volume there were only thirteen plates, six (XXII, XXIII, XXIV, XXVI, XXVIII, XXX), being double ones. Adding three portraits, the total is equivalent to twenty-two single plates. Owing to these discrepancies it has not been possible to ascertain with certainty the actual numbers in which the several plates appeared. Assuming, however, that a double plate was regarded as the equivalent of two single ones, that no more than two single plates or one double one was included in any number, that as far as possible, subject to the preceding conditions, the plates accompanied the letterpress to which they referred, and that the title page and index issued with number 12 were regarded as the equivalent of one plate, the plates may have appeared as indicated below.

COMPANION TO THE BOTANICAL MAGAZINE, VOL. I.

No. 1, pp. 1–32 [tt. I, II]—Aug. 1, 1835.
No. 2, pp. 33–64 [t. III]—Sept. 1, 1835.
No. 3, pp. 65–96 [tt. IV, V]—Oct. 1, 1835.
No. 4, pp. 97–128 [tt. VI, VII]—Nov. 1, 1835.
No. 5, pp. 129–160 [t. VIII]—Dec. 1, 1835.
No. 6, pp. 161–192 [tt. IX, X]—Jan. 1, 1836.
No. 7, pp. 193–224 [t. XI]—Febr. 1, 1836.
No. 8, pp. 225–256 [tt. XII, XIII]—March 1, 1836.
No. 9, pp. 257–288 [tt. XIV, XV]—April 1, 1836.
No. 10, pp. 289–320 [t. XVI]—May 1, 1836.
No. 11, pp. 321–352 [tt. XVII, XVIII]—June 1, 1836.
No. 12, pp. 353–384 [t. XIX]—July 1, 1836.

COMPANION TO THE BOTANICAL MAGAZINE, VOL. II.

No. 13, pp. 1–32 [tt. XX, XXI]—Aug. 1, 1836.
No. 14, pp. 33–64 [t. XXII]—Sept. 1, 1836.
No. 15, pp. 65–96 [t. XXIII]—Oct. 1, 1836.
No. 16, pp. 97–128 [portrait of David Douglas]—Nov. 1, 1836.

---

* By an oversight this advertisement was repeated verbatim on May 1, 1836, with the word " eighth " instead of " tenth."

No. 17, pp. 129–160 [t. XXIV]—Dec. 1, 1836.
No. 18, pp. 161–192 [t. XXV]—Jan. 1, 1837.
No. 19, pp. 193–224 [t. XXVI]—Febr. 1, 1837.
No. 20, pp. 225–256 [t. XXVII, and portrait of Richard Cunningham] —March 1, 1837.
No. 21, pp. 257–288 [t. XXVIII]—April 1, 1837.
No. 22, pp. 289–320 [portrait of John Fraser, and t. XXIX]—May 1, 1837.
No. 23, pp. 321–352 [t. XXX]—June 1, 1837.
No. 24, pp. 353–381 [tt. XXXI, XXXII]—July 1, 1937.

Since the dates of publication of the several parts of the text are known with certainty, while those of the plates are conjectural, only the former can be taken into account for the purposes of priority. Even if the tentative allocation of plates given above were proved to be correct by inspection of a set of the " Companion " in its original wrappers, no nomenclatural changes would be involved thereby, since the plates which seem to have been issued before the corresponding text are in all cases those of old species.

It has seemed worth while to investigate the dates of Hooker's Companion to the Botanical Magazine in view of the considerable number of important taxonomic papers which it contains. Among these are Hooker and Arnott's Contributions towards a flora of South America, Hooker's Contributions towards a flora of Van Diemen's Land, Wight and Arnott's Illustrations of Indian Botany, William Jack's Description of Malayan Plants, Bentham's Synopses of the Gerardieae, Buchnereae and Hemimerideae, and Observations on some new or little known genera and species of Scrophulariaceae, and Lindley's Notes on Drège's Cape Orchidaceae.

XLIV—CONTRIBUTIONS TO THE FLORA OF BURMA: XI.* C. E. C. Fischer.

Mucuna sempervirens *Hemsl.* [Papilionaceae].

Known from W. China.

Bhamo District, Sinlum Kaba, 5500 ft., fls. greenish-white, April, *J. H. Lace* ; Maymyo plateau, 3500 ft., frt. June, *J. H. Lace* 5811 and fls. March, *J. H. Lace* 6118.

Hoeckia Aschersoniana *Engl. et Graebn.* [Valerianaceae].

Previously known from China.

Burma-Tibet frontier, near source of Irawaddy, 28° 30′ N. 97° 45′ E., 12,000–14,000 ft., *Kingdon Ward*, grown at Kew from roots. " Forming matted growth with other herbaceous and woody plants."

Ophiorrhiza umbricola *W. W. Smith.* [Rubiaceae].

Previously reported from N. Burma (*Kingdon Ward*) as well as from China, but the present extends the range far to the south.

Amherst District, Mulayit Peak, 6200 ft., fls. Feb., *C. E. Parkinson* 5156 ; Bhamo District, Naru Bum, in evergreen forest at 7400 ft., fls. March, *Maung Mya* per *C. E. Parkinson* 5328. " 1–4 ft.

---

* Continued from *K.B.* 1932, 106.

high; stem grey; corolla white, stamens purple." In drying, the leaves and upper part of stems have turned purple and the corollas scarlet to purplish-red. Karen name; *Ta-thee-khor*. The leaves in these specimens attain a larger size than that given in the description.

Craibiodendron Henryi *W. W. Smith.* [Ericaceae].

Known from Yunnan.

Bhamo District, Pangkok, Lakpyekha, 6500 ft., frt. March, *Maung Mya* per *C. E. Parkinson* 4985; Myitkyina District, Htawgaw, 5700 ft., fls. June, *Sukoe* per *C. E. Parkinson* 10096. "Middle-sized tree; flowers white tinted red."

Palaquium Sukoei *C. E. C. Fischer*, sp. nov. [Sapotaceae]; *P. paucivenoso* Lam. accedit, sed foliorum nervis primariis paucioribus, fructibus oblongis multo majoribus differt.

A *tree*. *Leaves* aggregated at the ends of the twigs, thinly coriaceous, obovate or obovate-oblong, apex obtuse, sometimes retuse, base cuneate, shortly decurrent, 6·5–12·5 cm. long, 3·5–6·3 cm. wide, glabrous above, minutely appressed-pubescent below, drying brown, paler below, midrib slightly impressed above, prominent below, primary nerves 8 pairs, raised below, anatomosing in wide loops well within the margins, ultimate reticulations fine; petiole terete, 1–2·2 cm. long. *Flowers* axillary, fascicled, scented; bracts deciduous, linear-lanceolate, 3 mm. long, pedicels sulcate when dry, slender in flower, very thick in fruit, 0·8–1·2 cm. long, fulvous-tomentose. *Sepals* 6, in 2 rows, 5–5·4 mm. long, fulvous-tomentose without, pubescent on the upper half within, the 3 outer thick, fleshy, valvate, ovate from a broad base, obtuse, the 3 inner thinner and slightly shorter, elliptic, apex rounded, with a median vertical channel on the back corresponding with a keel within. *Corolla* white, narrowly turbinate, glabrous except the tube which is shortly hairy within; tube 2·5 mm. long; lobes 6, ligulate, obtuse, 4·5 mm. long. *Stamens* 12, inserted on the mouth of the corolla-tube; filaments subulate, 2·5 mm. long, patently white-villous; anthers ovate, bluntly apiculate, 1·5–2 mm. long. *Ovary* oblate, 1·5 mm. high, 2 mm. diam., densely hairy, 6-celled, ovules solitary in each cell, pendulous, flat. *Style* cylindric, 8–8·5 mm. long, glabrous, apex minutely 6-lobed. *Fruit* oblong, 4·2 cm. long, reddish-brown, minutely scaly.

Tenasserim, Tharapon, 800 ft., fls. May, *Sukoe* per *C. E. Parkinson* 11091 (type in Kew Herb.); 400 ft., frt. Feb., *Sukoe* per *C. E Parkinson* 10896. "Blaze purple or brick-red, exuding milky juice; heart-wood dark-red." Vern. name; *Pyinlebyin*.

Styrax biaristatus *W. W. Smith.* [Styracaceae.]

Known from Yunnan.

Myitkyina District, Htawgaw, 3100 ft., fls. April, *Sukoe* per *C. E. Parkinson* 9197; Pyetpat Pass, 7200 ft., fls. June, *Sukoe* per *C. E. Parkinson* 10115. "Tree; stem dark-grey; fls. white."

Torenia vagans *Roxb.* [Scrophulariaceae].

Known from Nepal to Assam and in S. India.

Bhamo-Shan State boundary, 45 miles from Bhamo, at roadside near Hkalon Inspection Bungalow, 4000 ft., fls. and frt. Sept., *J. N. List.*

Nepeta lamiopsis *Benth.* [Labiatae].

Known from Sikkim Himalayas.

Burma-Tibet frontier, near source of Irawaddy, *Kingdon Ward,* grown from roots at Kew. "Forming matted growth with other plants."

Polygonum viviparum *Linn.* [Polygonaceae].

Known from Kashmir to Sikkim.

Locality and details as in the last species.

Pseudotreblus indica *Bur.* [Moraceae].

Known from Assam.

Myitkyina District: confluence of the Hpungin Kha and the Mali Kha, 700 ft., fls. and frt. June, *Saw Maung Mya* per *C. E. Parkinson* 5462, "Stem brownish-white; twigs hanging; fls. white, frt. green."

XLV—MISCELLANEOUS NOTES.

OTTO STAPF. We have to record with great regret the death on August 4th, at the age of 75, of Dr. Otto Stapf, F.R.S., Keeper of the Herbarium from 1909 to 1922, and subsequently editor of the Botanical Magazine and the Index Londinensis. An appreciation of Dr. Stapf and his work will appear in the next number of the Bulletin.

CLIVE ERROL LORD. We record with deep regret the death of Mr. Clive Lord, Director of the Tasmanian Museum and Art Gallery. Mr. Lord was in constant correspondence with Kew during the last five years, and by his death at the early age of 44 a career, valuable both to Tasmanian Science and as a link between that country and British Naturalists, has been cut short.

Mr. Lord was born and educated at Hobart and served for some years on the staff of the Tasmanian Museum before being appointed Curator in 1918 and Director in 1922. As Director he did much to encourage the study of the Natural History of the Island, and himself contributed many papers to scientific journals on various aspects of the subject, especially on the fauna and flora of the National Park area in the west of the Island. He was part author of "The Vertebrate Animals of Tasmania."

Mr. Lord was especially active in recent years in adding to and improving the Botanic Garden and Herbarium, which were visited by the Director of Kew in 1928.

W. G. CRAIB. We record with deep regret, as this number goes to press, the death at Kew, on Sept. 1st, of Prof. W. G. CRAIB, F.R.S.E., Regius Professor of Botany in the University of Aberdeen.

The Botanical Magazine.—Part 3 of Volume 156 was published on July 1st, 1933, and contains the following plant portraits, opening with a description of the new genus *Pamianthe*, with one species *P. peruviana* Stapf (t. 9315), raised by Major Albert Pam, after whom it is named : it is a fine white-flowered Amaryllidaceous plant allied to *Pancratium* and comes from Peru :—*Cercis racemosa* Oliver (t. 9316), an interesting " Judas-Tree " from central China, with flowers similar to those of the familiar European *Cercis siliquastrum* ; *Sphenogyne versicolor* DC. (t. 9317), a charming annual from the north-western Cape Province and Little Namaqualand, South Africa, introduced to gardens early in the last century; *Kleinia radicans* DC. (t. 9318), the Klein-Bokkost (small goat's food) of the Karroo farmers, a native of the southern Karroo, South Africa ; *Rhododendron pubescens* Balf. f. & Forrest (t. 9319), a beautiful pink, small-flowered shrub from southern Szechuan and northwestern Yunnan ; *Ajuga grandiflora* Stapf (t. 9320), a new species allied to *A. australis* R. Br., from South Australia and New South Wales, which promises to be an interesting garden plant ; *Tulipa tarda* Stapf (t. 9321), a new species nearly allied to *T. persica* Hort and *T. turkestanica* E. Regel—probably a native of Turkestan ; *Hoya Kerrii* Craib (t. 9322), a species with obcordate leaves and revolute corollas, a native of northern Siam and French Indo-China ; *Rhododendron nilagiricum* Zenker (t. 9323), a native of the Deccan Peninsula and Ceylon and the earliest Indian rhododendron on record, having first been seen in Ceylon in 1344 ; *Hydrangea strigosa* Rehder (t. 9324), a native of Hupeh, Szechuan and Yunnan and *Physosiphon Lindleyi* Rolfe (t. 9325), a native of the province of Chiapas, Mexico.

Flora Capensis.—This work has now been completed as originally planned and a supplementary volume, forming Section 2 of vol. 5, and containing the Welwitschiaceae, Podocarpaceae, Cupressaceae and Cycadaceae, was published on March 25th, 1933.

The Preface written by the Director, which is here reprinted, gives the history of the undertaking.

" When the *Flora Capensis* was originally planned, it was intended to include the *Gnetaceae*, *Coniferae*, and the *Cycadaceae*. The description of *Welwitschia* was prepared for the purpose several years ago by the late Professor H. H. W. Pearson, and the Conifers were described by Dr. O. Stapf, F.R.S., late Keeper of the Herbarium and Library. Sir William Thiselton-Dyer, the Editor of the later volumes of the *Flora Capensis*, had always intended to write the account of the South African *Cycadaceae* after his retirement, but failing health prevented him from carrying out the project, to which he had for many years devoted considerable study. Shortly before his death he handed over to me the material he had collected together and his notes, expressing the wish that I should undertake the work. While in South Africa in 1930, I was able to discuss the matter with Dr. Rattray, who has made careful studies of the South African Cycads in the field, and has grown most of them in his garden. He very kindly agreed to collaborate with Mr. J. Hutchinson, F.L.S., in the preparation of the descriptions of the Cycads for this supplemental volume. While Mr. Hutchinson is mainly responsible for the technical descriptions, Dr. Rattray's intimate knowledge of the plants, as they grow in South Africa, has added very greatly to the value of the undertaking.

"The account of *Welwitschia* has been supplemented by Mr. Hutchinson to bring it up-to-date in the light of recent knowledge. It has been raised to family rank as distinct from *Gnetaceae* (*Gnetum* and *Ephreda*), with which it has probably little in common apart from the Gymnospermous character. Dr. Stapf has largely re-written his descriptions of the South African *Podocarpaceae* and *Cupressaceae*.

"The publication of this supplemental part of the *Flora Capensis* has been made possible by the generosity of the Government of the Union of South Africa, who on learning, through Kew, of the desire expressed by Botanists in South Africa for an account of the Gymnosperms, made a grant of £40 towards its publication.

"The history of the inception and completion of the *Flora Capensis* which deals with the flowering plants proper—*Angiospermae*—was published by Sir William Thiselton-Dyer in the *Kew Bulletin*, 1925, pp. 289–293, and his valedictory preface will be found in Vol. V, Sect. 2, Part IV, of the *Flora Capensis*, written on 23rd September, 1924.

"For the loan of herbarium material from South Africa we are much indebted to Dr. I. B. Pole Evans, C.M.G., Director of the Botanical Survey, to the Forestry Department in South Africa, and to the Directors of the Cape Town and Albany Museums."

The volume differs from the rest of the Flora in being provided with illustrations, which greatly add to the value of the work.

Among the Cycads, a new and interesting *Encephalartos*, *E. kosiensis* Hutch., is included. Full material of this has unfortunately not yet reached Kew, but we have since learnt that specimens in cultivation at Kirstenbosch and Durban are some 4 ft. or more in height and the cones are of a bright red colour.

One unfortunate printer's error was overlooked when reading the proofs relating to the recent discovery of a large area of *Welwitschia*. The locality where this was found is in the Kaoko-veld, S.W. Africa, and not "Kakao-veld" as printed.

It is hoped that this final volume will be of assistance to the botanists in S. Africa in dealing with their Conifers and Cycads.

Printed under the authority of HIS MAJESTY'S STATIONERY OFFICE.
By The South Essex Recorders, Ltd., High Road, Ilford.
(507) Wt 92/33 925 9/33 S.E.R. Ltd. Gp. 9.

BULLETIN OF MISCELLANEOUS
INFORMATION No. 8 1933
ROYAL BOTANIC GARDENS, KEW

XLVI—DR. OTTO STAPF, F.R.S.

In our last number we recorded with deep regret the death on August 4th of Dr. Otto Stapf, while on a well-earned holiday in Austria. Dr. Stapf had been at great pains to complete his work on the October issue of the Botanical Magazine before his holiday and it was noticed that he appeared a little tired when he left Kew. On reaching Austria he became somewhat unwell, and the sad news of his death came as a great shock to all his friends. After his forty-two years close connection with Kew, the death of so respected and valued a colleague is a very severe loss not only to his many friends but to botanists throughout the world.

Otto Stapf was the son of Joseph Stapf, and was born on March 23rd, 1857, at Ischl, Austria, where his father was Oberbergrat. His father soon after took charge of the salt springs at Hallstadt, and here he spent his boyhood. He commenced his botanical studies under Professor Wiesner at Vienna and was awarded the degree of Ph.D. at the end of his University course. He then became Assistant to Professor Kerner von Marilaun in 1882, and a Privat Docent in 1887. In 1885 he travelled in Persia and made a notable collection of plants; and during the years 1885–1889 he published a series of papers mainly dealing with the flora and vegetation of the Orient, and particularly of Persia. The most important of these were the account of the botanical results of the Polak expedition to Persia in 1882, and revision of the genus *Ephedra*.

It appears that he was not wholly satisfied with his position in Vienna after his return from his Persian expedition and early in 1890, when sending Sir Joseph Hooker a copy of his *Ephedra* monograph, he explained his reasons for wishing to leave Vienna. Later in that year he was offered the post of Assistant for India at Kew by Sir William Thiselton-Dyer, the post which had been vacated by W. B. Hemsley. Fortunately for Kew and for the study of Systematic Botany in this country, Stapf accepted this offer and arrived in England in November 1890, making a tour of European botanic gardens on his way. He commenced his work as Assistant for India at Kew in January 1891.

During his early years Stapf paid special attention to the Asiatic *Melastomaceae* and his paper on the *Sonerileae* of Asia was published in the Annals of Botany.

The large collection of plants made by Dr. G. D. Haviland on Mount Kinabalu in North-eastern Borneo was placed in Dr. Stapf's hands for identification on its receipt in 1892, and the results of his work on the collection were incorporated in a comprehensive account of the flora of Mount Kinabalu which he contributed to the Linnean Society.

On the completion of this work in 1894, Stapf assisted Sir Joseph Hooker in his elaboration of the *Gramineae* for the Flora of British India and devoted much of his time to the work. Hooker (Life & Letters, **2**, 186), writing to the late Mr. J. F. Duthie on May 20, 1895, said: " Stapf has worked up the Indian *Poas*, and after carefully revising his work, I do not think it could be better done." In a letter to Mr. Duthie, dated June 26, 1896 (Life & Letters, **2**, 287), Hooker wrote: " I have put *Poa*, *Festuca* and *Bromus* into Stapf's hands, as he is well up in the S. European and Persian species. In respect of *Poa* his work agrees well with Hackel's determinations of your plants, but as to *Festuca* they are wide apart. After two struggles with the latter genus I gave it up, and I shall be curious to know what future observers make of Stapf's determinations. I can certify to the extreme care with which he has worked, but my impression is that the whole of *ovina* and *rubra* and *duriuscula* groups are utterly unmanageable." In the Flora of British India, Stapf's name appears as the author of the work on the genera *Catabrosa*, *Eragrostis*, *Poa*, *Festuca* and *Bromus*. His revision of the genus *Eragrostis* deserves special mention, on account of the peculiar difficulties involved in classifying its numerous and often closely-allied species.

Turning now to his more intimate connection with Kew, after his appointment in 1899 as Principal Assistant in the Herbarium, it was quickly felt how excellent a preparation his earlier career had been for the systematic studies which were to occupy the greater part of his life. His travels in Persia and his experience of teaching at Vienna gave him a breadth of view sometimes lacking in the specialist. Then, too, his knowledge of European languages was of great value to him and to Kew, for there were few languages with which he was entirely unacquainted, and his ability to write to, and converse with, Continental botanists in their own tongue greatly added to the intercourse between Kew and botanical institutions on the Continent.

Those who had the good fortune to work under Stapf's guidance in the Kew Herbarium owe a great deal to the kindly interest which he took in the progress of the junior members of the staff, and to the example of thoroughness in systematic research set by him.

Wherever possible, Stapf verified his determinations by careful comparison with types of authenticated material, and in the absence of this by comparison with descriptions. He utilized to the full the unrivalled facilities afforded by the Library, and acquired a very extensive bibliographical knowledge, which stood him in good stead subsequently as Honorary Editor of the " Index Londinensis." Though he never engaged in bibliographical research as such, many notes in the botanical volumes at Kew testify to his care in ascertaining the dates of publication of particular works or parts. Notes and sketches of dissections on the herbarium sheets also bear witness to his unremitting industry. A very large number of detailed drawings of the spikelets of grasses are scattered throughout most of the genera in the Herbarium. These are of great value in determining specimens and show him to have been a draughtsman much above the average. While most of his published work was concerned purely with systematic botany, his interests were far wider. He had a considerable knowledge of ancient botany and particularly of Dioscorides, a subject in which his acquaintance with the Oriental flora was of great value. Unfortunately, however, his notes on the determination of the plants of Dioscorides were not completed, and remain unpublished. As an aid to floristic and phytogeographical studies he supervised the compilation by Mrs. Stapf of a card-catalogue of maps published during the last fifty years, and placed this at the disposal of his colleagues.

Stapf was always interested in the geographical distribution of plants, his principal contribution to that branch of study being an account of the Southern Element in the British Flora.

His sound morphological and anatomical knowledge is shown in his papers on the structure of the female flower and fruit of *Sararanga sinuosa*, the fruit of *Melocanna bambusoides* and the Aconites of India (1905), and in the account of the families *Pedaliaceae* and *Martyniaceae* published in Engler and Prantl's Pflanzenfamilien.

His contributions to Nomenclature were few but practical, consisting of statements of the cases for the retention of certain well-known names of grasses rejected by other authors. The two most important are papers on " *Setaria* or *Chaetochloa* " (1920) and " The Nomenclature of *Bromus* " (1928).

Stapf's botanical career may conveniently be divided into five sections.

(1) 1882–1889. Academic work, travels in Persia, study of the Oriental flora.

(2) 1890–1898 (as Assistant for India), to which reference has already been made.

(3) 1899–1908 (as Principal Assistant). Work on the " Flora of Tropical Africa " and " Flora Capensis " including the accounts of the families *Apocynaceae*, *Orobanchaceae*, *Lentibulariaceae* and *Pedaliaceae*. An enumeration of the known plants of Liberia was published in Sir Harry Johnston's " Liberia " (1906). To this period also belong Stapf's monographs on " The Aconites of India " (1905) and the " Oilgrasses of India and Ceylon " (1906), the completion of the *Gramineae* for the " Flora Capensis," an enumeration of the grasses of British Somaliland (1907), and a general account of the grass-flora of South Africa. Although more than thirty years have passed since the publication of the *Gramineae* in the " Flora Capensis," it is still the

standard work on South African grasses. His paper on the fruit of *Melocanna bambusoides*, mentioned above, also appeared during this period, which was perhaps the most brilliant part of his career, and his election as F.R.S. in 1908 marked the recognition by the scientific world of his high attainments and great services to botany.

(4) 1909–1921 (as Keeper of the Herbarium). After becoming Keeper of the Herbarium, Stapf had naturally less time for original investigation, and on the other hand a still wider sphere of interest. The *Myristicaceae* and *Lauraceae* of the " Flora of Tropical Africa " appeared in 1909.

The determination of critical plants cultivated in the Gardens resulted in papers on species of *Epacris* (1910), *Osmanthus* (1911), *Crataegus* (1914), *Phelipaea* (1915) and *Gunnera* (1919).

Stapf continued to work on the *Gramineae* throughout his Keepership, naming all the grasses in the new collections received during that period, and gradually getting the material already in the Herbarium into good order. Thanks to his work on the *Gramineae*, very many valuable collections have been received at Kew for determination and incorporation in the Herbarium. He published an enumeration of the grasses of Siam (1912), isolated descriptions of new genera and species of grasses from Africa, Australia, etc., and a series of papers on economic grasses including Manchurian Water-rice (1908), Blue Couch (1911), Elephant Grass (1912), Rice Grass (1914), Iburu and Fundi (1915), Kikuyu Grass (1921) and Efwatakala Grass (1922). Stapf was the first to suggest the hybrid origin of *Spartina Townsendii*, a suggestion which was later confirmed cytologically by Huskins. During the years 1917–1920 four parts of the *Gramineae* of " Flora of Tropical Africa " appeared including the *Andropogoneae* and about half of the *Paniceae*. Stapf's grouping of the genera of the *Andropogoneae* (a most difficult tribe), in the "Flora of Tropical Africa" is original and essentially practical, while the classification of cultivated Sorghums in the same work is of great value both to botanists and agriculturists. An entire part (25 plates) of Hooker's " Icones Plantarum " was devoted to new genera and species of grasses, mostly from tropical Africa.

(5) 1922–1933 (Retirement). With other men retirement means usually a slackening of output, but with Stapf it meant merely a change of work. Partly for financial reasons—he had only twenty-three years as a Civil Servant and his pension was proportionately small—but mainly from the love of his subject, Stapf continued to labour as actively as before. He was Editor of the " Botanical Magazine " from 1922 until his death, and under the auspices of the Royal Horticultural Society raised the scientific standard of the Magazine to a pitch which it had never before attained. The preparation of the plates was supervised with scrupulous care and the letterpress contained all that could be said of the subject. The appreciation of the horticultural world was marked by the award in 1927 of the V.M.H. by the

Royal Horticultural Society. An account of "The Botanical Magazine: its history and mission" was given by Stapf in Journ. R. Hort. Soc. **51**, 29 (1926).

As Honorary Editor of the "Index Londinensis" for the Royal Horticultural Society Stapf performed another great service for botany and horticulture. This monumental work in six volumes includes references to all plates and figures of Flowering Plants and Ferns published from 1753 to 1920 inclusive. It was planned by Stapf and carried out at Kew under his constant supervision. The cross-references which add so greatly to its usefulness could have been supplied only by a botanist of wide experience. The value of the Index is being increasingly realized by both botanists and horticulturists. Before its appearance it sometimes meant a long search to find a figure of a particular plant. Now, by the chronological arrangement adopted, it is easy not only to find the best figures of a species, but also to trace its botanical and horticultural history from the time of Linnaeus onwards. Stapf's great services to Horticulture in bringing out the "Index Londinensis" were recognized on its completion by the award of a Veitch Memorial Gold Medal by the Royal Horticultural Society (*K.B.* 1932, 44).

The "Botanical Magazine" and "Index Londinensis" left him little time for other research, and his work on tropical African grasses came to a standstill for some years. A fifth part of the *Gramineae* of the "Flora of Tropical Africa," written in collaboration with Mr. C. E. Hubbard, appeared, however, in 1930, and a sixth is now in the press. The account of the *Podocarpaceae* and *Cupressaceae* in "Flora Capensis," **5**, sect. 2, Supplement, appeared in 1933.

Stapf was intimately connected with the Linnean Society for many years. In 1898 he was awarded the honour of A.L.S., becoming F.L.S. in 1902. He was elected to the Council in 1904 and served as Botanical Secretary from 1908 to 1916, taking an active part in botanical discussions. In 1927 he was awarded the Linnean medal in recognition of his services to science (Proc. Linn. Soc. 1926–27, 53). His continental distinctions included the Corresponding Membership of the Vienna Academy of Sciences and of the German Horticultural Society, and the Honorary Membership of the German Botanical Society.

In paying this tribute to Stapf's devoted service to the Science of Botany and to this country, which he had made his home, reference must be made to the great difficulty in which he was placed at the time of the war. His feelings must often have been strained to the utmost with relatives and friends ranking as enemies of this country, but, though he had to bear unkind remarks from time to time from busybodies in the neighbourhood and often felt sad and depressed, Stapf stood by the country of his adoption and never failed in his untiring and loyal service to Great Britain.

No. 17, pp. 129–160 [t. XXIV]—Dec. 1, 1836.
No. 18, pp. 161–192 [t. XXV]—Jan. 1, 1837.
No. 19, pp. 193–224 [t. XXVI]—Febr. 1, 1837.
No. 20, pp. 225–256 [t. XXVII, and portrait of Richard Cunningham] —March 1, 1837.
No. 21, pp. 257–288 [t. XXVIII]—April 1, 1837.
No. 22, pp. 289–320 [portrait of John Fraser, and t. XXIX]—May 1, 1837.
No. 23, pp. 321–352 [t. XXX]—June 1, 1837.
No. 24, pp. 353–381 [tt. XXXI, XXXII]—July 1, 1937.

Since the dates of publication of the several parts of the text are known with certainty, while those of the plates are conjectural, only the former can be taken into account for the purposes of priority. Even if the tentative allocation of plates given above were proved to be correct by inspection of a set of the " Companion " in its original wrappers, no nomenclatural changes would be involved thereby, since the plates which seem to have been issued before the corresponding text are in all cases those of old species.

It has seemed worth while to investigate the dates of Hooker's Companion to the Botanical Magazine in view of the considerable number of important taxonomic papers which it contains. Among these are Hooker and Arnott's Contributions towards a flora of South America, Hooker's Contributions towards a flora of Van Diemen's Land, Wight and Arnott's Illustrations of Indian Botany, William Jack's Description of Malayan Plants, Bentham's Synopses of the Gerardieae, Buchnereae and Hemimerideae, and Observations on some new or little known genera and species of Scrophulariaceae, and Lindley's Notes on Drège's Cape Orchidaceae.

XLIV—CONTRIBUTIONS TO THE FLORA OF BURMA: XI.* C. E. C. Fischer.

Mucuna sempervirens *Hemsl.* [Papilionaceae].

Known from W. China.

Bhamo District, Sinlum Kaba, 5500 ft., fls. greenish-white, April, *J. H. Lace*; Maymyo plateau, 3500 ft., frt. June, *J. H. Lace* 5811 and fls. March, *J. H. Lace* 6118.

Hoeckia Aschersoniana *Engl. et Graebn.* [Valerianaceae].

Previously known from China.

Burma-Tibet frontier, near source of Irawaddy, 28° 30′ N. 97° 45′ E., 12,000–14,000 ft., *Kingdon Ward*, grown at Kew from roots. " Forming matted growth with other herbaceous and woody plants."

Ophiorrhiza umbricola *W. W. Smith.* [Rubiaceae].

Previously reported from N. Burma (*Kingdon Ward*) as well as from China, but the present extends the range far to the south.

Amherst District, Mulayit Peak, 6200 ft., fls. Feb., *C. E. Parkinson* 5156; Bhamo District, Naru Bum, in evergreen forest at 7400 ft., fls. March, *Maung Mya* per *C. E. Parkinson* 5328. " 1–4 ft.

---

* Continued from *K.B.* 1932, 106.

high; stem grey; corolla white, stamens purple." In drying, the leaves and upper part of stems have turned purple and the corollas scarlet to purplish-red. Karen name; *Ta-thee-khor*. The leaves in these specimens attain a larger size than that given in the description.

Craibiodendron Henryi *W. W. Smith.* [Ericaceae].

Known from Yunnan.

Bhamo District, Pangkok, Lakpyekha, 6500 ft., frt. March, *Maung Mya* per *C. E. Parkinson* 4985; Myitkyina District, Htawgaw, 5700 ft., fls. June, *Sukoe* per *C. E. Parkinson* 10096. "Middle-sized tree; flowers white tinted red."

Palaquium Sukoei *C. E. C. Fischer*, sp. nov. [Sapotaceae]; *P. paucivenoso* Lam. accedit, sed foliorum nervis primariis paucioribus, fructibus oblongis multo majoribus differt.

A *tree*. *Leaves* aggregated at the ends of the twigs, thinly coriaceous, obovate or obovate-oblong, apex obtuse, sometimes retuse, base cuneate, shortly decurrent, 6·5–12·5 cm. long, 3·5–6·3 cm. wide, glabrous above, minutely appressed-pubescent below, drying brown, paler below, midrib slightly impressed above, prominent below, primary nerves 8 pairs, raised below, anatomosing in wide loops well within the margins, ultimate reticulations fine; petiole terete, 1–2·2 cm. long. *Flowers* axillary, fascicled, scented; bracts deciduous, linear-lanceolate, 3 mm. long, pedicels sulcate when dry, slender in flower, very thick in fruit, 0·8–1·2 cm. long, fulvous-tomentose. *Sepals* 6, in 2 rows, 5–5·4 mm. long, fulvous-tomentose without, pubescent on the upper half within, the 3 outer thick, fleshy, valvate, ovate from a broad base, obtuse, the 3 inner thinner and slightly shorter, elliptic, apex rounded, with a median vertical channel on the back corresponding with a keel within. *Corolla* white, narrowly turbinate, glabrous except the tube which is shortly hairy within; tube 2·5 mm. long; lobes 6, ligulate, obtuse, 4·5 mm. long. *Stamens* 12, inserted on the mouth of the corolla-tube; filaments subulate, 2·5 mm. long, patently white-villous; anthers ovate, bluntly apiculate, 1·5–2 mm. long. *Ovary* oblate, 1·5 mm. high, 2 mm. diam., densely hairy, 6-celled, ovules solitary in each cell, pendulous, flat. *Style* cylindric, 8–8·5 mm. long, glabrous, apex minutely 6-lobed. *Fruit* oblong, 4·2 cm. long, reddish-brown, minutely scaly.

Tenasserim, Tharapon, 800 ft., fls. May, *Sukoe* per *C. E. Parkinson* 11091 (type in Kew Herb.); 400 ft., frt. Feb., *Sukoe* per *C. E Parkinson* 10896. "Blaze purple or brick-red, exuding milky juice; heartwood dark-red." Vern. name; *Pyinlebyin*.

Styrax biaristatus *W. W. Smith.* [Styracaceae.]

Known from Yunnan.

Myitkyina District, Htawgaw, 3100 ft., fls. April, *Sukoe* per *C. E. Parkinson* 9197; Pyetpat Pass, 7200 ft., fls. June, *Sukoe* per *C. E. Parkinson* 10115. "Tree; stem dark-grey; fls. white."

Torenia vagans *Roxb.* [Scrophulariaceae].

Known from Nepal to Assam and in S. India.

Bhamo-Shan State boundary, 45 miles from Bhamo, at roadside near Hkalon Inspection Bungalow, 4000 ft., fls. and frt. Sept., *J. N. List.*

Nepeta lamiopsis *Benth.* [Labiatae].

Known from Sikkim Himalayas.

Burma-Tibet frontier, near source of Irawaddy, *Kingdon Ward,* grown from roots at Kew. "Forming matted growth with other plants."

Polygonum viviparum *Linn.* [Polygonaceae].

Known from Kashmir to Sikkim.

Locality and details as in the last species.

Pseudotreblus indica *Bur.* [Moraceae].

Known from Assam.

Myitkyina District: confluence of the Hpungin Kha and the Mali Kha, 700 ft., fls. and frt. June, *Saw Maung Mya* per *C. E. Parkinson* 5462, "Stem brownish-white; twigs hanging; fls. white, frt. green."

XLV—MISCELLANEOUS NOTES.

OTTO STAPF. We have to record with great regret the death on August 4th, at the age of 75, of Dr. Otto Stapf, F.R.S., Keeper of the Herbarium from 1909 to 1922, and subsequently editor of the Botanical Magazine and the Index Londinensis. An appreciation of Dr. Stapf and his work will appear in the next number of the Bulletin.

CLIVE ERROL LORD. We record with deep regret the death of Mr. Clive Lord, Director of the Tasmanian Museum and Art Gallery. Mr. Lord was in constant correspondence with Kew during the last five years, and by his death at the early age of 44 a career, valuable both to Tasmanian Science and as a link between that country and British Naturalists, has been cut short.

Mr. Lord was born and educated at Hobart and served for some years on the staff of the Tasmanian Museum before being appointed Curator in 1918 and Director in 1922. As Director he did much to encourage the study of the Natural History of the Island, and himself contributed many papers to scientific journals on various aspects of the subject, especially on the fauna and flora of the National Park area in the west of the Island. He was part author of "The Vertebrate Animals of Tasmania."

Mr. Lord was especially active in recent years in adding to and improving the Botanic Garden and Herbarium, which were visited by the Director of Kew in 1928.

W. G. CRAIB. We record with deep regret, as this number goes to press, the death at Kew, on Sept. 1st, of Prof. W. G. CRAIB, F.R.S.E., Regius Professor of Botany in the University of Aberdeen.

The Botanical Magazine.—Part 3 of Volume 156 was published on July 1st, 1933, and contains the following plant portraits, opening with a description of the new genus *Pamianthe*, with one species *P. peruviana* Stapf (t. 9315), raised by Major Albert Pam, after whom it is named: it is a fine white-flowered Amaryllidaceous plant allied to *Pancratium* and comes from Peru:—*Cercis racemosa* Oliver (t. 9316), an interesting "Judas-Tree" from central China, with flowers similar to those of the familiar European *Cercis siliquastrum*; *Sphenogyne versicolor* DC. (t. 9317), a charming annual from the north-western Cape Province and Little Namaqualand, South Africa, introduced to gardens early in the last century; *Kleinia radicans* DC. (t. 9318), the Klein-Bokkost (small goat's food) of the Karroo farmers, a native of the southern Karroo, South Africa; *Rhododendron pubescens* Balf. f. & Forrest (t. 9319), a beautiful pink, small-flowered shrub from southern Szechuan and northwestern Yunnan; *Ajuga grandiflora* Stapf (t. 9320), a new species allied to *A. australis* R. Br., from South Australia and New South Wales, which promises to be an interesting garden plant; *Tulipa tarda* Stapf (t. 9321), a new species nearly allied to *T. persica* Hort and *T. turkestanica* E. Regel—probably a native of Turkestan; *Hoya Kerrii* Craib (t. 9322), a species with obcordate leaves and revolute corollas, a native of northern Siam and French Indo-China; *Rhododendron nilagiricum* Zenker (t. 9323), a native of the Deccan Peninsula and Ceylon and the earliest Indian rhododendron on record, having first been seen in Ceylon in 1344; *Hydrangea strigosa* Rehder (t. 9324), a native of Hupeh, Szechuan and Yunnan and *Physosiphon Lindleyi* Rolfe (t. 9325), a native of the province of Chiapas, Mexico.

Flora Capensis.—This work has now been completed as originally planned and a supplementary volume, forming Section 2 of vol. 5, and containing the Welwitschiaceae, Podocarpaceae, Cupressaceae and Cycadaceae, was published on March 25th, 1933.

The Preface written by the Director, which is here reprinted, gives the history of the undertaking.

"When the *Flora Capensis* was originally planned, it was intended to include the *Gnetaceae*, *Coniferae*, and the *Cycadaceae*. The description of *Welwitschia* was prepared for the purpose several years ago by the late Professor H. H. W. Pearson, and the Conifers were described by Dr. O. Stapf, F.R.S., late Keeper of the Herbarium and Library. Sir William Thiselton-Dyer, the Editor of the later volumes of the *Flora Capensis*, had always intended to write the account of the South African *Cycadaceae* after his retirement, but failing health prevented him from carrying out the project, to which he had for many years devoted considerable study. Shortly before his death he handed over to me the material he had collected together and his notes, expressing the wish that I should undertake the work. While in South Africa in 1930, I was able to discuss the matter with Dr. Rattray, who has made careful studies of the South African Cycads in the field, and has grown most of them in his garden. He very kindly agreed to collaborate with Mr. J. Hutchinson, F.L.S., in the preparation of the descriptions of the Cycads for this supplemental volume. While Mr. Hutchinson is mainly responsible for the technical descriptions, Dr. Rattray's intimate knowledge of the plants, as they grow in South Africa, has added very greatly to the value of the undertaking.

"The account of *Welwitschia* has been supplemented by Mr. Hutchinson to bring it up-to-date in the light of recent knowledge. It has been raised to family rank as distinct from *Gnetaceae* (*Gnetum* and *Ephreda*), with which it has probably little in common apart from the Gymnospermous character. Dr. Stapf has largely re-written his descriptions of the South African *Podocarpaceae* and *Cupressaceae*.

"The publication of this supplemental part of the *Flora Capensis* has been made possible by the generosity of the Government of the Union of South Africa, who on learning, through Kew, of the desire expressed by Botanists in South Africa for an account of the Gymnosperms, made a grant of £40 towards its publication.

"The history of the inception and completion of the *Flora Capensis* which deals with the flowering plants proper—*Angiospermae*—was published by Sir William Thiselton-Dyer in the *Kew Bulletin*, 1925, pp. 289–293, and his valedictory preface will be found in Vol. V, Sect. 2, Part IV, of the *Flora Capensis*, written on 23rd September, 1924.

"For the loan of herbarium material from South Africa we are much indebted to Dr. I. B. Pole Evans, C.M.G., Director of the Botanical Survey, to the Forestry Department in South Africa, and to the Directors of the Cape Town and Albany Museums."

The volume differs from the rest of the Flora in being provided with illustrations, which greatly add to the value of the work.

Among the Cycads, a new and interesting *Encephalartos*, *E. kosiensis* Hutch., is included. Full material of this has unfortunately not yet reached Kew, but we have since learnt that specimens in cultivation at Kirstenbosch and Durban are some 4 ft. or more in height and the cones are of a bright red colour.

One unfortunate printer's error was overlooked when reading the proofs relating to the recent discovery of a large area of *Welwitschia*. The locality where this was found is in the Kaoko-veld, S.W. Africa, and not " Kakao-veld " as printed.

It is hoped that this final volume will be of assistance to the botanists in S. Africa in dealing with their Conifers and Cycads.

Printed under the authority of His Majesty's Stationery Office.
By The South Essex Recorders, Ltd., High Road, Ilford.
(507) Wt. 92/33 925 9/33 S.E.R. Ltd. Gp. 9.

INST AGR. RE

BULLETIN OF MISCELLANEOUS
INFORMATION No. 8 1933
ROYAL BOTANIC GARDENS, KEW

XLVI—DR. OTTO STAPF, F.R.S.

In our last number we recorded with deep regret the death on August 4th of Dr. Otto Stapf, while on a well-earned holiday in Austria. Dr. Stapf had been at great pains to complete his work on the October issue of the Botanical Magazine before his holiday and it was noticed that he appeared a little tired when he left Kew. On reaching Austria he became somewhat unwell, and the sad news of his death came as a great shock to all his friends. After his forty-two years close connection with Kew, the death of so respected and valued a colleague is a very severe loss not only to his many friends but to botanists throughout the world.

Otto Stapf was the son of Joseph Stapf, and was born on March 23rd, 1857, at Ischl, Austria, where his father was Oberbergrat. His father soon after took charge of the salt springs at Hallstadt, and here he spent his boyhood. He commenced his botanical studies under Professor Wiesner at Vienna and was awarded the degree of Ph.D. at the end of his University course. He then became Assistant to Professor Kerner von Marilaun in 1882, and a Privat Docent in 1887. In 1885 he travelled in Persia and made a notable collection of plants ; and during the years 1885–1889 he published a series of papers mainly dealing with the flora and vegetation of the Orient, and particularly of Persia. The most important of these were the account of the botanical results of the Polak expedition to Persia in 1882, and revision of the genus *Ephedra*.

It appears that he was not wholly satisfied with his position in Vienna after his return from his Persian expedition and early in 1890, when sending Sir Joseph Hooker a copy of his *Ephedra* monograph, he explained his reasons for wishing to leave Vienna. Later in that year he was offered the post of Assistant for India at Kew by Sir William Thiselton-Dyer, the post which had been vacated by W. B. Hemsley. Fortunately for Kew and for the study of Systematic Botany in this country, Stapf accepted this offer and arrived in England in November 1890, making a tour of European botanic gardens on his way. He commenced his work as Assistant for India at Kew in January 1891.

During his early years Stapf paid special attention to the Asiatic *Melastomaceae* and his paper on the *Sonerileae* of Asia was published in the Annals of Botany.

The large collection of plants made by Dr. G. D. Haviland on Mount Kinabalu in North-eastern Borneo was placed in Dr. Stapf's hands for identification on its receipt in 1892, and the results of his work on the collection were incorporated in a comprehensive account of the flora of Mount Kinabalu which he contributed to the Linnean Society.

On the completion of this work in 1894, Stapf assisted Sir Joseph Hooker in his elaboration of the *Gramineae* for the Flora of British India and devoted much of his time to the work. Hooker (Life & Letters, **2**, 186), writing to the late Mr. J. F. Duthie on May 20, 1895, said: "Stapf has worked up the Indian *Poas*, and after carefully revising his work, I do not think it could be better done." In a letter to Mr. Duthie, dated June 26, 1896 (Life & Letters, **2**, 287), Hooker wrote: "I have put *Poa, Festuca* and *Bromus* into Stapf's hands, as he is well up in the S. European and Persian species. In respect of *Poa* his work agrees well with Hackel's determinations of your plants, but as to *Festuca* they are wide apart. After two struggles with the latter genus I gave it up, and I shall be curious to know what future observers make of Stapf's determinations. I can certify to the extreme care with which he has worked, but my impression is that the whole of *ovina* and *rubra* and *duriuscula* groups are utterly unmanageable." In the Flora of British India, Stapf's name appears as the author of the work on the genera *Catabrosa*, *Eragrostis*, *Poa*, *Festuca* and *Bromus*. His revision of the genus *Eragrostis* deserves special mention, on account of the peculiar difficulties involved in classifying its numerous and often closely-allied species.

Turning now to his more intimate connection with Kew, after his appointment in 1899 as Principal Assistant in the Herbarium, it was quickly felt how excellent a preparation his earlier career had been for the systematic studies which were to occupy the greater part of his life. His travels in Persia and his experience of teaching at Vienna gave him a breadth of view sometimes lacking in the specialist. Then, too, his knowledge of European languages was of great value to him and to Kew, for there were few languages with which he was entirely unacquainted, and his ability to write to, and converse with, Continental botanists in their own tongue greatly added to the intercourse between Kew and botanical institutions on the Continent.

Those who had the good fortune to work under Stapf's guidance in the Kew Herbarium owe a great deal to the kindly interest which he took in the progress of the junior members of the staff, and to the example of thoroughness in systematic research set by him.

Wherever possible, Stapf verified his determinations by careful comparison with types of authenticated material, and in the absence of this by comparison with descriptions. He utilized to the full the unrivalled facilities afforded by the Library, and acquired a very extensive bibliographical knowledge, which stood him in good stead subsequently as Honorary Editor of the "Index Londinensis." Though he never engaged in bibliographical research as such, many notes in the botanical volumes at Kew testify to his care in ascertaining the dates of publication of particular works or parts. Notes and sketches of dissections on the herbarium sheets also bear witness to his unremitting industry. A very large number of detailed drawings of the spikelets of grasses are scattered throughout most of the genera in the Herbarium. These are of great value in determining specimens and show him to have been a draughtsman much above the average. While most of his published work was concerned purely with systematic botany, his interests were far wider. He had a considerable knowledge of ancient botany and particularly of Dioscorides, a subject in which his acquaintance with the Oriental flora was of great value. Unfortunately, however, his notes on the determination of the plants of Dioscorides were not completed, and remain unpublished. As an aid to floristic and phytogeographical studies he supervised the compilation by Mrs. Stapf of a card-catalogue of maps published during the last fifty years, and placed this at the disposal of his colleagues.

Stapf was always interested in the geographical distribution of plants, his principal contribution to that branch of study being an account of the Southern Element in the British Flora.

His sound morphological and anatomical knowledge is shown in his papers on the structure of the female flower and fruit of *Sararanga sinuosa*, the fruit of *Melocanna bambusoides* and the Aconites of India (1905), and in the account of the families *Pedaliaceae* and *Martyniaceae* published in Engler and Prantl's Pflanzenfamilien.

His contributions to Nomenclature were few but practical, consisting of statements of the cases for the retention of certain well-known names of grasses rejected by other authors. The two most important are papers on " *Setaria* or *Chaetochloa* " (1920) and " The Nomenclature of *Bromus* " (1928).

Stapf's botanical career may conveniently be divided into five sections.

(1) 1882–1889. Academic work, travels in Persia, study of the Oriental flora.

(2) 1890–1898 (as Assistant for India), to which reference has already been made.

(3) 1899–1908 (as Principal Assistant). Work on the " Flora of Tropical Africa " and " Flora Capensis " including the accounts of the families *Apocynaceae, Orobanchaceae, Lentibulariaceae* and *Pedaliaceae*. An enumeration of the known plants of Liberia was published in Sir Harry Johnston's " Liberia " (1906). To this period also belong Stapf's monographs on " The Aconites of India " (1905) and the " Oilgrasses of India and Ceylon " (1906), the completion of the *Gramineae* for the " Flora Capensis," an enumeration of the grasses of British Somaliland (1907), and a general account of the grass-flora of South Africa. Although more than thirty years have passed since the publication of the *Gramineae* in the " Flora Capensis," it is still the

standard work on South African grasses. His paper on the fruit of *Melocanna bambusoides*, mentioned above, also appeared during this period, which was perhaps the most brilliant part of his career, and his election as F.R.S. in 1908 marked the recognition by the scientific world of his high attainments and great services to botany.

(4) 1909–1921 (as Keeper of the Herbarium). After becoming Keeper of the Herbarium, Stapf had naturally less time for original investigation, and on the other hand a still wider sphere of interest. The *Myristicaceae* and *Lauraceae* of the " Flora of Tropical Africa " appeared in 1909.

The determination of critical plants cultivated in the Gardens resulted in papers on species of *Epacris* (1910), *Osmanthus* (1911), *Crataegus* (1914), *Phelipaea* (1915) and *Gunnera* (1919).

Stapf continued to work on the *Gramineae* throughout his Keepership, naming all the grasses in the new collections received during that period, and gradually getting the material already in the Herbarium into good order. Thanks to his work on the *Gramineae*, very many valuable collections have been received at Kew for determination and incorporation in the Herbarium. He published an enumeration of the grasses of Siam (1912), isolated descriptions of new genera and species of grasses from Africa, Australia, etc., and a series of papers on economic grasses including Manchurian Water-rice (1908), Blue Couch (1911), Elephant Grass (1912), Rice Grass (1914), Iburu and Fundi (1915), Kikuyu Grass (1921) and Efwatakala Grass (1922). Stapf was the first to suggest the hybrid origin of *Spartina Townsendii*, a suggestion which was later confirmed cytologically by Huskins. During the years 1917–1920 four parts of the *Gramineae* of " Flora of Tropical Africa " appeared including the *Andropogoneae* and about half of the *Paniceae.* Stapf's grouping of the genera of the *Andropogoneae* (a most difficult tribe), in the "Flora of Tropical Africa" is original and essentially practical, while the classification of cultivated Sorghums in the same work is of great value both to botanists and agriculturists. An entire part (25 plates) of Hooker's " Icones Plantarum " was devoted to new genera and species of grasses, mostly from tropical Africa.

(5) 1922–1933 (Retirement). With other men retirement means usually a slackening of output, but with Stapf it meant merely a change of work. Partly for financial reasons—he had only twenty-three years as a Civil Servant and his pension was proportionately small—but mainly from the love of his subject, Stapf continued to labour as actively as before. He was Editor of the " Botanical Magazine " from 1922 until his death, and under the auspices of the Royal Horticultural Society raised the scientific standard of the Magazine to a pitch which it had never before attained. The preparation of the plates was supervised with scrupulous care and the letterpress contained all that could be said of the subject. The appreciation of the horticultural world was marked by the award in 1927 of the V.M.H. by the

Royal Horticultural Society. An account of "The Botanical Magazine: its history and mission" was given by Stapf in Journ. R. Hort. Soc. **51**, 29 (1926).

As Honorary Editor of the "Index Londinensis" for the Royal Horticultural Society Stapf performed another great service for botany and horticulture. This monumental work in six volumes includes references to all plates and figures of Flowering Plants and Ferns published from 1753 to 1920 inclusive. It was planned by Stapf and carried out at Kew under his constant supervision. The cross-references which add so greatly to its usefulness could have been supplied only by a botanist of wide experience. The value of the Index is being increasingly realized by both botanists and horticulturists. Before its appearance it sometimes meant a long search to find a figure of a particular plant. Now, by the chronological arrangement adopted, it is easy not only to find the best figures of a species, but also to trace its botanical and horticultural history from the time of Linnaeus onwards. Stapf's great services to Horticulture in bringing out the "Index Londinensis" were recognized on its completion by the award of a Veitch Memorial Gold Medal by the Royal Horticultural Society (*K.B.* 1932, 44).

The "Botanical Magazine" and "Index Londinensis" left him little time for other research, and his work on tropical African grasses came to a standstill for some years. A fifth part of the *Gramineae* of the "Flora of Tropical Africa," written in collaboration with Mr. C. E. Hubbard, appeared, however, in 1930, and a sixth is now in the press. The account of the *Podocarpaceae* and *Cupressaceae* in "Flora Capensis," **5**, sect. 2, Supplement, appeared in 1933.

Stapf was intimately connected with the Linnean Society for many years. In 1898 he was awarded the honour of A.L.S., becoming F.L.S. in 1902. He was elected to the Council in 1904 and served as Botanical Secretary from 1908 to 1916, taking an active part in botanical discussions. In 1927 he was awarded the Linnean medal in recognition of his services to science (Proc. Linn. Soc. 1926–27, 53). His continental distinctions included the Corresponding Membership of the Vienna Academy of Sciences and of the German Horticultural Society, and the Honorary Membership of the German Botanical Society.

In paying this tribute to Stapf's devoted service to the Science of Botany and to this country, which he had made his home, reference must be made to the great difficulty in which he was placed at the time of the war. His feelings must often have been strained to the utmost with relatives and friends ranking as enemies of this country, but, though he had to bear unkind remarks from time to time from busybodies in the neighbourhood and often felt sad and depressed, Stapf stood by the country of his adoption and never failed in his untiring and loyal service to Great Britain.

Although undoubtedly Stapf's main interests were scientific he was also very fond of literature and art in its broadest sense. This wide outlook on life helped him to enjoy to the full his travels, whether in England or abroad. It was a real pleasure and education to go on a botanical ramble with him.

To those who did not know Stapf very well, he would appear to possess a somewhat autocratic manner, but under that rather austere exterior was the kindliest of men and one of the most modest. He had wonderful patience and, as those who worked with him can testify, never spared himself in helping others. In the death of Stapf, science has lost a great man, and those who were privileged to know him well, a staunch and understanding friend.

SELECT LIST OF WORKS IN CHRONOLOGICAL SEQUENCE.

Die botanischen Ergebnisse der Polak'schen Expedition nach Persien in Jahre 1882. *Denkschr. Akad. Wien,* **50,** 1–72 (1885); 271–346 (1886).

Beiträge zur Flora von Lycien, Carien und Mesopotamien. *Denkschr. Akad. Wien,* **50,** 73–120 (1885); **51,** 347–384 (1886).

Vegetationsbilder aus dem südlichen und mittleren Persien. *Bot. Centralbl.* **27,** 211–214, 243–245, 275–278 (1886).

Die Pflanzenreste der Hallstätter Heidengebirges. *Verh. Zool.-Bot. Ges. Wien,* **36,** 407–418 (1886).

Ueber einige Iris-Arten des Botanischen Gartens in Wien. *Oesterr. Bot. Zeitschr.* **37,** 373–377, 415–419 (1887); **38,** 12–15 (1888).

Ueber die Stachelpflanzen der iranischen Steppen. *Sitzb. Zool.-Bot. Ges. Wien,* **37,** 35–39 (1887).

Beiträge zur Flora von Persien. *Verh. Zool.-Bot. Ges. Wien,* **38,** 549–552 (1888); **39,** 205–212 (1889).

Die Arten der Gattung Ephedra. *Denkschr. Akad. Wien,* **56,** 1–112, tt. 1–5 (1889).

Ueber den Champignonschimmel als Vernichter von Champignonculturen. *Verh.-Zool.-Bot. Ges. Wien,* **39,** 617–622 (1889).

Die Arten der Gattung Adonis. *Sitzb. Zool.-Bot. Ges. Wien,* **39,** 73–75 (1889).

On the Sonerileae of Asia. *Ann. Bot.* **6,** 291–323, t. 17 (1892).

On the Flora of Mount Kinabalu, in North Borneo. *Trans. Linn. Soc., Bot.* **4,** 69–263, t. 11–20 (1894).

Pedaliaceae. *Engl. u. Prantl, Die natürlichen Pflanzenfamilien,* **4,** pt. 3b, 253–265 (1895).

Martyniaceae. *Ibid.* 265–269.

On the structure of the female flower and fruit of Sararanga sinuosa Hemsl. (Pandanaceae). *Journ. Linn. Soc., Bot.* **32,** 479–489, tt. 4–7 (1896).

Gramineae: Catabrosa, Eragrostis, Poa, Festuca and Bromus. *Hooker, J.D., Fl. Brit. Ind.* **7,** 310–327, 337–346, 348–362 (1896).

The botanical history of the Uva, pampas grass and their allies. *Gard. Chron.* ser. 3, **22,** 358, 378, 396 (1897).

Gramineae. *Dyer, Fl. Cap.* **7,** 310–384 (1898); 385–576 (1899); 577–750, 760–765 (1900).

Dicellandra, Hook. f., and Phaeoneuron, Gilg (Melastomaceae). *Journ. Linn. Soc., Bot.* **34,** 482–495, t. 19 (1900).

Sonerila (with G. King). King, Materials for a Flora of the Malayan Peninsula, **2,** 426–452 (1900).

Apocynaceae. *Dyer, Fl. Trop. Afr.* **4,** sect. 1, 24–231 (1902); 588–614 (1904).

On the nomenclature of the Pampas-grass. *Gard. Chron.* ser. 3, **34,** 399–400 (1903).

On the fruit of Melocanna bambusoides, Trin., an endospermless, viviparous genus of Bambuseae. *Trans. Linn. Soc., Bot.* **6,** 401–425, tt. 45–47 (1904).

Orobanchaceae (with W. P. Hiern). *Dyer, Fl. Cap.* **4,** sect. 2, 421–422 (1904).

Lentibularieae. *Ibid.* 423–437 (1904).

Pedalineae. *Ibid.* 454–463 (1904).

Himalayan Bamboos. *Gard. Chron.* ser 3, **35,** 305–306, 325–326, 340, 356, 409 (1904).

Die Gliederung der Gräserflora von Sudafrika. *Urban u. Graebner, Festchrift Ascherson,* 391–412 (1904).

Xerochloa. *Engl. Bot. Jahrb.* **35,** 64–68 (1904).

The Pampas grasses (Cortaderia, Stapf). *Flora and Sylva,* **3,** 171–175 (1905).

Contributions to the flora of Liberia. *Journ. Linn. Soc., Bot.* **37,** 79–115 (1905).

Graminées nouvelles de la Guinée française récoltées par M. Pobeguin. *Journ. de Bot.* **19,** 98–108 (1905).

The Aconites of India, a monograph. *Ann. Roy. Bot. Gard. Calc.* **10,** 115–197, tt. 92–116 (1905).

On Kickxia and Funtumia. *Kew Bull.* 1905, 45–59 (1906).

The Statices of the Canaries of the subsection Nobiles. *Ann. Bot.* **20,** 205–212, 301–310 (1906).

The Oil-Grasses of India and Ceylon. *Kew Bull.* 1906, 297–363.

Orobanchaceae. *Dyer, Fl. Trop. Afr.* **4,** sect. 2, 462–468 (1906).

Lentibularieae. *Ibid.* 468–499 (1906).

Pedalineae. *Ibid.* 538–570 (1906).

The known plants of Liberia. *Johnston, Liberia,* **2,** 570–669, figs. 246–266 (1906).

Plantae Novae Daweanae in Uganda lectae (with T. A. Sprague and others). *Journ. Linn. Soc., Bot.* **37,** 495–532 (1906).

Apocynaceae. *Dyer, Fl. Cap.* **4,** sect. 1, 490–518 (1907).

The grasses of British Somaliland. *Kew Bull.* 1907, 203–228.

Mgoa rubber in British East Africa (Mascarenhasia elastica, K. Schum.). *Kew Bull.* 1907, 283–285.

A new rubber tree: Palo Amarillo (Euphorbia fulva, Stapf). *Kew Bull.* 1907, 294–296.

Additions to the Florula Marmarica. *Kew Bull.* 1907, 365–369.

The Gums Ammoniac of Morocco and the Cyrenaica. *Kew Bull.* 1907, 375–388.

Hallieracantha, a new genus of Acanthaceae. *Journ. Linn. Soc., Bot.* **38,** 6–17 (1907).

Rediscovery of Statice arborea and discovery of a new allied species. *Ann. Bot.* **22,** 115–116 (1908).

Spartina Townsendii. *Gard. Chron.* ser. 3, **43,** 33–35, figs. 17–20 (1908) ; *Journ. Bot.* **46,** 76–81 (1908).

Gynoecium or Gynaecium. *Gard. Chron.* l.c. 252 (1908).

Some suffrutescent Apocynaceae from Angola. *Journ. Bot.* **46,** 209–212, 395, t. 492 (1908).

Ecanda rubber (Raphionacme utilis, Brown et Stapf). *Kew Bull.* 1908, 209–215, cum tab.

Teo-non, a new rubber tree from Tonkin (Bleekrodea tonkinensis, Dub. et Eberh.). *Kew Bull.* 1908, 262–265.

Polyadoa and Holalafia. *Kew Bull.* 1908, 302–304.

Novitates Florae Africanae : Gramineae. *Bull. Soc. Bot. France,* Mém. **8,** 97–105 (1908).

The South African bamboo (Arundinaria tessellata, Munro). *Kew Bull.* 1909, 59–61.

The herbarium Savatier. *Kew Bull.* 1909, 148–150.

Toowoomba canary grass (Phalaris bulbosa, L.). *Kew Bull.* 1909, 289–292.

Lignum nephriticum. *Kew Bull.* 1909, 293–305.

The Manchurian water-rice (Zizania latifolia, Turcz.). *Kew Bull.* 1909, 385–390.

Myristicaceae. *Dyer, Fl. Trop. Afr.* **6,** sect. 1, 156–167 (1909).

Lauraceae. *Ibid.* 171–188 (1909).

Peglera and Nectaropetalum (with L. A. Boodle). *Kew Bull.* 1909, 188–191.

Gardenia Thunbergia and its allies (with J. Hutchinson). *Journ. Linn. Soc., Bot.* **38,** 417–428, t. 37 (1909).

Diagnoses Plantarum Africae : Gramineae. *Journ. de Bot.* sér 2, **2,** 204–215 (1909).

The History of the Wheats. *Rep. Brit. Ass.* 1909, 799–807 (1910) ; *Journ. Board Agric.* **17,** Suppl. 4, 71–83 (1910).

Epacris heteronema, Labill. and E. dubia, Lindl. *Kew Bull.* 1910, 213–217, cum tab.

Garnotiella. *Kew Bull.* 1910, 301–302.

Osmanthus Aquifolium and O. Fortunei. *Kew Bull.* 1911, 177–181, cum tab.

Blue couch : a new lawn grass (Digitaria didactyla, Willd.). *Kew Bull.* 1911, 256–261.

Laurineae. *Dyer, Fl. Cap.* **5,** sect. 1, 493–502 (1912).

Proteaceae (part). *Dyer, Fl. Cap.* **5,** sect. 1, 502–509, 552–643 (with E. P. Phillips) (1912).

A new ground bean (Kerstingiella geocarpa, Harms). *Kew Bull.* 1912, 209–213, cum tab.

Elephant grass. A new fodder plant. (Pennisetum purpureum, Schum.). *Kew Bull.* 1912, 309–316.

Akaniaceae: a new family of Sapindales. *Kew Bull.* 1912, 378–380.

Contributions to the flora of Siam: Gramineae. *Kew Bull.* 1912, 427–434.

A new banana from the Transvaal (Musa Davyae, Stapf). *Kew Bull.* 1913, 102–104.

The Imperial Botanic Garden of Peter the Great at St. Petersburg. *Kew Bull.* 1913, 243–255, cum 2 tab.

The bicentenary of the Botanic Garden of St. Petersburg. *Nature,* **91,** 451–452 (1913).

The Southern Element in the British Flora. *Engl. Bot. Jahrb.* **50,** Suppl., 509–525 (1914).

Townsend's grass or rice grass, Spartina Townsendii. *Proc. Nat. Sc. Soc. Bournemouth,* **5,** 76–82, tt. 1–3 (1914); *Journ. Bot.* **52,** 245–247 (1914).

The Mexican hawthorn (Crataegus pubescens, H. B. K.). *Kew Bull.* 1914, 289–298.

Encephalartos Hildebrandtii. *Kew Bull.* 1914, 388–392.

The genus Phelipaea. *Kew Bull.* 1915, 285–296.

The South African camphor tree. *Kew Bull.* 1915, 297–298.

A new Euphorbia from St. Helena (with A. Thellung). *Kew Bull.* 1916, 200–201.

Iburu and Fundi, two cereals of Upper Guinea (Digitaria Iburua; D. exilis). *Kew Bull.* 1915, 381–386.

Cycas Thouarsii. *Kew Bull.* 1916, 1–8.

Stipa Neesiana in England. *Kew Bull.* 1916, 206–208.

Enneapogon mollis in Ascension Island. *Kew Bull.* 1917, 217–219.

Gramineae. *Dyer, Fl. Trop. Afr.* **9,** 1–192 (1917); 193–384 (Jan. 1919); 385–576 (June 1919); 577–768 (1920); 769–944 (with C. E. Hubbard) (1930); 945–1100 (in the press).

Gunnera manicata and G. brasiliensis. *Kew Bull.* 1919, 376–378.

Thellungia, a new genus of Gramineae. *Kew Bull.* 1920, 96–99.

Setaria or Chaetochloa? *Kew Bull.* 1920, 124–127.

The botanical history of the "Sindian" and the age of Abraham's Oak. *Kew Bull.* 1920, 258–264.

Kikuyu grass (Panicum clandestinum, Chiov.). *Kew Bull.* 1921, 85–93.

Daturicarpa, a new genus of Apocynaceae. *Kew Bull.* 1921, 166–171, figs. 1–2.

Efwatakala grass (Melinis minutiflora, Beauv.). *Kew Bull.* 1922, 307–310 (historical account).

Notes on African grasses (with C. E. Hubbard). *Kew Bull.* 1926, 366–368, 440–446; 1927, 72–74, 264–272; 1929, 263–265; 1933, 269–302.

Matluang of Chili (Ephedra sinica Stapf). *Kew Bull.* 1927, 133–134.

Setaria glauca and S. lutescens. *Kew Bull.* 1928, 147–149.

The Nomenclature of Bromus. *Kew Bull.* 1928, 209–211.
Podocarpaceae and Cupressaceae. *Hill, Fl. Cap.* **5**, sect. 2, Suppl. 3–24, figs. 1–2 (1933).
Curtis's Botanical Magazine (Editor and main Author). Volumes **148–156**, tt. 8934–9332 (1922–1933).
Iconum Botanicarum Index Londinensis (Editor). Vol. **1**, 1–547 (1929); **2**, 1–548 (1930); **3**, 1–555 (1930); **4**, 1–568 (1930); **5**, 1–549 (1931); **6**, 1–570 (1931).

XLVII—THE DATES OF PUBLICATION OF ROYLE'S ILLUSTRATIONS. T. A. SPRAGUE.

Royle's Illustrations of the Botany of the Himalayan Mountains consists of one volume of text, and a second of plates, each bearing the date 1839 on the title page. The work was, however, issued in eleven parts at 20s. each, from 1833 to 1840, the dates of publication being given on p. lxxx (unnumbered) of the Introduction, facing p. 1. Each of the first ten numbers included 32, 40 or 48 pages of text of the "Illustrations" and ten plates, while the eleventh or supplementary number contained 88 pages of text, in addition to pp. xxi–lxxx of the Introduction, the Table of Contents and Indexes, and two plates. An additional complication in determining the dates of botanical names published in Royle's "Illustrations" is the fact that the plates were not in all cases issued along with the corresponding letterpress. Thus—to anticipate for a moment—the plate of *Delphinium cashmerianum* Royle (t. 12) was published in part I (Sept. 1833), whereas the corresponding description did not appear till part II (March 1834). As the plate contains analyses, the valid publication of this name dates from 1833, not from 1834 as would appear from the list given on p. lxxx. Similarly the plate of *Saxifraga spinulosa* Royle (t. 50, fig. 2) appeared before the corresponding text, as is evident from Royle's remarks on p. 227.

The most satisfactory way of determining the details of issue of a work of this kind is of course to examine a copy still in the original wrappers. No such copy of Royle's book being known, recourse must be had to reviews and notices in contemporary journals, and to advertisements of the "Illustrations" on the wrappers of other works. Information has been obtained from the following sources: Loudon's Gardener's Magazine vols. **9–16** (1833–1840); Journal of the Asiatic Society, vol. **3** (1834); Journal of Literature and Science, Madras, vol. **1** (1834); Edinburgh New Philosophical Journal, vols. **16–17** (1834); Flora vol. **17**, pt. 1 (1834); Magazine of Natural History, vols. **7** (1834) and **8** (1835); Jahrbücher für wissenschaftliche Kritik, Berlin, 1838, vol. **2**; and the wrappers of Curtis's Botanical Magazine from April 1, 1834 to June 1, 1840.

The following dates of publication were supplied in Royle's "Illustrations," p. lxxx:—

No. 1, pp. 1–40, Sept. 1833.
No. 2, pp. 41–72, March 1834.
No. 3, pp. 73–104, June 1834.
No. 4, pp. 105–136, Sept. 1834.
No. 5, pp. 137–176, Jan. 1835.
No. 6, pp. 177–216, April 1835.
No. 7, pp. 217–248, August 1835.
No. 8, pp. 249–288, Dec. 1835.
No. 9, pp. 289–336, May 1836.
No. 10, pp. 337–384, Feb. 1839.
Suppl. No., pp. 385–472, Introduction pp. xxi–lxxviii, Table of Contents, and Indexes, 1840.

The contents and dates of the individual numbers may now be considered.

Part I.—Although this is listed as having appeared in September 1833, it is definitely stated in Loudon's Gardener's Magazine, **9,** 691 (Dec. 1833) that it "was published in the middle of October." According to Flora, **17,** pt. 1, 119 (1834), Robert Brown, at a scientific meeting held at Breslau on Sept. 21, 1833, distributed copies of the prospectus of Royle's "Illustrations," and exhibited specimens of the work, both text and plates. From the account given, it is not certain whether these specimens ("Proben") were proofs or actual copies of No. 1. Although there is some reason to doubt the accuracy of the date "September 1833" given in Royle's book, it must be accepted in the absence of proof to the contrary (International Rules, ed. 2, art. 39). The reviewer in Loudon's Gardener's Magazine may have given the date of receipt of a review copy as the date of publication.

According to Loudon's Gardener's Magazine (l.c.), part I included the following ten plates: 4, *Lagomys alpinus* (the Alpine Hare); 11, *Anemone discolor, Ranunculus polypetalus, Isopyrum grandiflorum, I. microphyllum*; 12, *Delphinium cashmerianum*; 13, *Aconitum heterophyllum*; 14, *Cimicifuga frigida*; 15, *Meconopsis aculeata*; 16, *Corydalis cashmeriana, C. Govaniana*; 17, *Tauscheria desertorum*; 18, *Viola serpens, V. reniformis, V. kunawarensis*; 22, *Grewia elastica*. The same list of plants is given in Journ. As. Soc. **3,** 143 (March 1834). The text corresponding to plates 11–17 appeared in part II, and that of plates 18 and 22 in part III.

Part II.—The notice of this part in Loud. Gard. Mag. **10,** 149 (April 1834) is characterized by several inaccuracies. The reviewer states that "it supplies descriptions of plants figured in the eighteen [sic] plates published in the first part, and contains eleven [sic] additional plates. Of these one [plate 1] is devoted to an exhibition of sections of the geology of the parts of the country spoken of, and the ten [sic] plates bear pictures of plants to which the following names are applied:—[19] *Polygala Myrsinites, furcata, crotalarioides, triphylla*; [20] *Silene Falconeriana*; *Lychnis fimbriata*; [21] *Leucostemma latifolia, angustifolia*; *Arenaria festucoides*; [23] *Gossypium* *herbaceum, arboreum* ; [24] *Eurya acuminata* ; *Hypericum japonicum* ; [25] *Cedrela serrata* ; [26] *Cissus rosea, capreolata* ; [27] *Geranium Lindleyanum* ; [28] *Impatiens bicolor, glandulifera*." Part I included ten plates, not eighteen ; part II also included ten plates, as is stated in the advertisement of Royle's " Illustrations " on the wrapper of Curtis's Botanical Magazine for April 1, 1834. Indeed, the plants mentioned by the reviewer himself occupy only nine, not ten plates. The notice of part II in the Edinburgh New Philosophical Journal, **17**, 204 (1834) mentions that it contained *nine* coloured plates of new plants and a geological section of the Himalayan mountains. According to Journ. Lit. Sc. Madras, **1**, 328 (1834), parts I–II included 18 plates containing 34 plants : this agrees with the details given above. Not all the plants figured in part I were described in part II : the letterpress corresponding to plates 18 and 22 appeared in part III, as mentioned above.

Part II contained also the first eight pages (pp. v–xii) of the Introduction : the review in Journ. As. Soc. **3**, 530 (Oct. 1834) mentions that the introductory remarks break off at the twelfth page ; and according to Jahrb. Wiss. Krit., Berlin, 1838, **2**, 401, pp. i–xx appeared in parts II–III.

Part III.—Information as to the plates included in this part is less precise. According to Loudon, Gard. Mag. **10**, 392 (Aug. 1834), it contained pp. xiii–xx of the Introduction, pp. 73–104 of the text, with one plate of fossil plants, one of animals, and eight of living plants. The plants are unfortunately not specified. It may, however, be assumed that they were the next eight plates in consecutive order, namely nos. 29–36 inclusive. These illustrate 14 species of plants, and the review in Journ. As. Soc. **3**, 535 (Oct. 1834) states that part III " contains plates of fourteen new plants ; two zoological ; and one plate of the fossil plants of the Burdwan coal formation." It is true that not all the 14 plants were new species, but the reviewer might easily have been unaware of this. According to Mag. Nat. Hist. **7**, 480 (1834), the zoological plate was no. 5 (*Cervus* spp.). The plates concerned may accordingly be identified as : no. 2 (Fossil Plants) ; 5 (*Cervus dodur* and *C. rutwa*) ; 29, *Dictamnus himalayanus* ; 30, *Biebersteinia odora* ; 31, *Euonymus echinata, Odina wodier* ; 32, *Thermopsis barbata, Edwardsia mollis* ; 33, *Uraria lagopoides, Astragalus leucocephalus* ; 34, *Caragana Gerardiana, Genista versicolor* ; 35, *Parochetus communis, Smithia ciliata* ; 36, *Aquilaria Agallocha, Astragalus Grahamianus*.

Part IV.—The data with regard to this part are also less definite. According to Loud. Gard. Mag. **11**, 86 (Febr. 1835), it included nine coloured plates of plants. Assuming these to have been the next nine in consecutive order, they were : 37, *Cassia lanceolata* ; 38, *Prinsepia utilis, Cerasus cornuta* ; 39, *Sieversia elata, Dalibarda calycina* ; 40, *Potentilla Cautleyana, P. pteropoda, Sibbaldia purpurea* ; 41, *Potentilla Saundersiana, P. microphylla, P. Inglisii* ; 42, *Rosa sericea, R. Webbiana* ; 43, *Circaea cordata, Epilobium laxum* ; 44, *Lythrum cashmerianum, Myricaria bracteata*; 45, *Conocarpus latifolia, Sonerila tenera*—19 plants in all: this figure agrees with the statement in Mag. Nat. Hist. **7,** 608 (1834). The tenth plate was apparently the Plan of the Botanic Garden, Saharunpore (frontispiece to vol. **2**). It should be mentioned that Meisner (Gen. **2,** 72) cited *Prinsepia* Royle from part III of Royle's "Illustrations." This I believe to be a mistake. It is known that numbers on the wrappers of parts were sometimes written, not printed (as in the case of parts 4 and 6 of Seemann's Botany of the Herald), and if this was the case with Royle's book there was a double possibility of error. Meisner was not always correct in his citations from Royle's "Illustrations." Thus he cited the subgeneric name *Amphicome* erroneously as published in 1835, instead of 1836, and *Cyananthus* from p. 304 instead of p. 309. The description of *Leucostemma* appeared in part III of Royle's "Illustrations," as stated by Meisner, but the figure (t. 21, fig. 1, 2) was issued in part II. Both description and figure of *Murdannia* are cited by Meisner from 1839, whereas the description (p. 403) did not appear till 1840. In view of these inaccuracies, no reliance can be placed on Meisner's citations from Royle.

Part V.—According to Loud. Gard. Mag. **11,** 199 (April 1835), this included nine plates of plants, and one plate [no. 3] of fossil bones, teeth and shells. The plates of plants, if issued in consecutive numerical order, were:—46, *Philadelphus tomentosus, Deutzia corymbosa*; 47, *Cucumis pubescens, C. pseudo-Colocynthis, C. Hardwickii*; 48, *Sedum linearifolium, S. azureum, S. coccineum*; 49, *Saxifraga imbricata, S. ciliata, S. ramulosa*; 50, *Saxifraga stenophylla, S. spinulosa, Parnassia nubicola*; 51, *Pycnocycla glauca, Eriocycla nuda*; 52, *Osmorrhiza laxa, Hymenolaena Govaniana*; 53, *Kohautia coccinea, Lonicera bracteata*; 54, *Nardostachys jatamansi*. We have evidence that t. 51 appeared in part V: Decaisne cited *Pycnocycla* Royle from fasc. V. t. 51 (Ann. Sc. Nat. sér. 2, **3,** 257).

Part VI.—The review of this part in Loud. Gard. Mag. **12,** 142 (March 1836) states that it contained a view of the Himalayan Mountains [frontispiece], a plate of birds [no. 7, according to Mag. Nat. Hist. **8,** 415: 1835], and eight plates of plants. Assuming that the latter were issued in numerical sequence, they were as follows:—55, *Morina Wallichiana, Scabiosa speciosa*; 56, *Echinops nivea, Cyathidium taraxacifolium*; 57, *Dolomiaea macrocephala*; 58, *Aster angustifolius, Calimeris flexuosa, Galatella juncea*; 59, *Aplotaxis gnaphaloides, Chaptalia gossypina*; 60, *Corvisartia indica, Ligularia arnicoides*; 61, *Mulgedium macrorhizum, M. sagittatum*; 62, *Campanula cashmeriana, Codonopsis rotundifolia.*

Part VII.—This contained two non-botanical plates, namely, nos. 8 and 9 (Mag. Nat. Hist. **8,** 584: 1835). The eight botanical plates were presumably:—63, *Andromeda fastigiata, Gaultheria nummularioides, G. trichophylla*; 64, *Rhododendron lepidotum, Rh. anthopogon*; 65, *Olea ferruginea, Syringa Emodi*; 66, *Orthanthera* *viminea, Holostemma Brunoniana, Ceropegia Wallichii* ; 67, *Swertia caerulea, S. alternifolia* ; 68, *Gentiana coronata, G. kurroo, G. contorta* ; 69, *Cyananthus lobatus, C. integer, Codonopsis ovata* ; 70, *Didymocarpus macrophylla, Chirita bifolia.*

Part VIII.—This seems to have contained ten botanical plates :—71, *Platystemma violoides, Picrorhiza kurrooa* ; 72, *Incarvillea diffusa, Pedicularis versicolor* ; 73, *Anchusa moltkioides, Lantana dubia, Gymnandra cashmeriana* ; 74, *Eremostachys superba* ; 75, *Phlomis cashmeriana, Salvia hians* ; 76, *Primula rosea, P. elliptica* ; 77, *Primula obtusifolia, P. purpurea* ; 78, *Rheum spiciforme* ; 79 (63a), *Thibaudia variegata, Gaylussacia serrata* ; 80, *Begonia echinata, Polygonum vaccinifolium, P. Brunonis.*—Plate 79 containing *Thibaudia* and *Gaylussacia* is numbered " 63a or 79 " the lower number indicating its correct position in taxonomic sequence after *Andromeda* and *Gaultheria* (t. 63).

Part IX.—Here we return to firmer ground. According to Loud. Gard. Mag. **12,** 319 (June 1836) the plates included *Elaeagnus parvifolia,* four species of *Euphorbia, Pinus khutrow, Quercus dealbata* [sic], *Pinus longifolia* and *P. Gerardiana, Abies pindrow, Crocus sativus* var. *cashmerianus.* As *Elaeagnus* is no. 81 and *Crocus* is no. 90, it may be assumed that the ten plates were as follows :—81, *Elaeagnus parvifolia, Daphne mucronata* ; 82, *Euphorbia pentagona, E. humilis, E. nana, E. cashmeriana* ; 83, *Procris racemosa, P. peduncularis, P. obtusa* ; 84, *Pinus khutrow, Quercus dealbata** ; 85, *Pinus longifolia, P. Gerardiana* ; 86, *Abies pindrow* ; 87, *Aceras angustifolia, Peristylus goodyeroides, Herminium gramineum* ; 88, *Cyrtopera flava, Dendrobium alpestre* ; 89, *Roscoea alpina, R. lutea, R. purpurea* ; 90, *Crocus sativus* var. *cashmerianus, Iris nepalensis.*

Part X.—The plates issued with this part were apparently the following :—10 (Lepidoptera, etc.) ; 91, *Burmannia coelestis, Iris longifolia, Hypoxis minor* ; 92, *Lilium Thomsonianum, Fritillaria verticillata* ; 93, *Trillium Govanianum, Lloydia himalensis, Ll. kunawurensis* ; 94, *Smilax maculata, S. Villandia* ; 95, *Butomus lanceolatus, Gagea elegans, Murdannia scapiflora* ; 96, *Ophiopogon intermedius, Uvularia Leschenaultiana* ; 98 (84a), *Populus ciliata, Falconeria insignis, F. Wallichii* ; 99 (78a), *Rheum Webbianum, Balanophora dioica* ; 100 (83a), *Putranjiva Roxburghii.* Plates 6 and 97 appeared in part XI.

Part XI.—According to Loud. Gard. Mag. **16,** 348 (July 1840), this contained the title pages of vols. **1** and **2,** the dedications, preface, table of contents, synoptic table of contents, the completion of the introduction [pp. xxi–lxxviii] including the geology, meteorology and entomology, descriptions of insects, accounts of mammals and birds, indexes, list of plates, and list of 197 plants figured. The plates were no. 6, Fossils of the Sub-Himalayan or Sewalik Hills, and no. 97, *Eriocaulon Sollyanum, Hordeum Aegiceras, Andropogon Calamus-*

---

*An error for *Q. dilatata,* corrected in copies issued subsequently—see p. 389.

aromaticus. Presumably the leaf (pp. lxxix-lxxx, unnumbered) of "corrigenda et addenda," and dates of publication of the several numbers, was also issued with this part.

CONTENTS OF PARTS AND DATES OF PUBLICATION.

Part I (Sept. 1833): Pages 1–40, Plates 4, 11–18, 22.

Part II (March 1834): Pages v–xii, 41–72, Plates 1, 19–21, 23–28.

Part III (June 1834): Pages xiii–xx, 73–104, Plates 2, 5, 29–36.

Part IV (Sept. 1834): Pages 105–136, Plates 37–45, and Plan of Botanic Garden, Saharunpore (Frontispiece of vol. **2**).

Part V (Jan. 1835): Pages 137–176, Plates 3, 46–54.

Part VI (April 1835): Pages 177–216, Plates 7, 55–62, and View of the Himalaya Mountains (Frontispiece of vol. **1**).

Part VII (Aug. 1835): Pages 217–248, Plates 8, 9, 63–70.

Part VIII (Dec. 1835): Pages 249–288, Plates 71–80.

Part IX (May 1836); Pages 289–336, Plates 81–90.

Part X (Febr. 1839): Pages 337–384, Plates 10, 91–96, 98–100.

Part XI (1840, prior to July). Pages xxi–lxxx, 385–472, Plates 6, 97, Title pages, Dedications, Preface, Tables of contents, List of plates, Alphabetical list of plants figured.

DATES OF NEW SPECIES FIGURED BY ROYLE.

The dates of the unfigured new species may be ascertained from the foregoing summary. The dates of those figured in Royle are given below. They fall into two categories: (1) those with figures accompanied by analyses, which date from the publication of the plate, where this is earlier than the corresponding text; (2) those without analyses, which date from the publication of the description (if any) in the text.

The question of what constitutes an "analysis" under Art. 37 of the International Rules may be briefly considered. The underlying consideration was doubtless to exclude illustrations which did not show details required for determination. Hence mere general pictures of a species were excluded. Such details may be shown by supplying figures of either (1) dissected or detached parts, whether natural size or magnified, or (2) enlarged parts, such as an entire flower. An excellent example of the latter is found in Jacq. Ic. Pl. Rar. t. 203, which includes figures of two highly magnified but undissected flowers. These show all the points required for specific determination, although the parts of the flower are not drawn separately.

New combinations which appeared for the first time on the plates are also included here for convenience sake, although their valid publication dates from the issue of the corresponding text, in which the synonyms on which they were based were cited.

Abies pindrow Royle, t. 86, fig. a–i (May 1836).—In his general remarks on p. 351 (Febr. 1839) Royle adopted the name *Abies* *pindrow*, but on p. 354, the description supplied by D. Don is headed *Pinus* v. *Picea pindrow* (vide *Kew Bull.* 1933, 414).

Aconitum heterophyllum Wall. ex Royle, t. 13, fig. 1–4 (Sept. 1833).

Anchusa moltkioides Royle, t. 73, fig. 1, a–h (Dec. 1835).

Andropogon Calamus-aromaticus Royle, Essay Antiq. Hindoo Med. 34, 82 (1838), nomen; Royle, Illustr. 425, t. 97, fig. 3, a–c (1840). Figure 3c is an "analysis," being an enlarged raceme, showing details not visible in the general figure.—*A. Calamus-aromaticus* Royle is now reduced to *Cymbopogon Martini* (Roxb.) Stapf.

Anemone discolor Royle, p. 52 (March 1834).—There is no analysis accompanying the figure (t. 11, fig. 1): the representation of the back of a detached flower cannot be regarded as such.

Aplotaxis gnaphaloides DC. ex Royle t. 59, fig. 1 (April 1835).—There are no analyses, and no description in the text (p. 251). The valid publication of the name dates from DC. in DC. Prodr. **6,** 542 (1837), as *A. gnaphalodes.*

Arenaria festucoides Royle, p. 81 (June 1834).—The figure (t. 21, fig. 3) lacks dissections.

Aster angustifolius Lindl. t. 58, fig. 1 (April 1835).—The figure is without analyses, and there is no description in the text (p. 251). Reduced to *A. altaicus* Willd. in Fl. Brit. Ind. In any case the name cannot be used since it is a later homonym of *A. angustifolius* Jacq. (1798).

Astragalus Grahamianus Royle, t. 36, fig. 2, a–f* (June 1834).

Astragalus leucocephalus Graham ex Benth., t. 32, fig. 2, a–f (June 1834).

Balanophora dioica R. Br. ex Royle, t. 99 (78a), fig. 2, cum anal. (Febr. 1839).—There is no description of the species in the text, p. 136 (May 1836). A description was first supplied by J. D. Hooker in Trans. Linn. Soc. **22,** 45 (1856), but the name dates, for purposes of priority, from 1839.

Begonia echinata Wall. ex Royle, t. 80, fig. 1, a–g (Dec. 1835).

Calimeris (sphalm. *Calameris*) *flexuosa* Royle, t. 58, fig. 2, a (April 1835).—Antedates the citation from DC. Prodr. **5,** 258 (1836), given in Index Kewensis.

Campanula cashmeriana Royle, t. 62, fig. 1, a (April 1835).

Caragana Gerardiana Royle, t. 34, fig. 1, a–g (June 1834).

Cedrela serrata Royle, t. 25, fig. a–f (March 1834).

Cerasus cornuta Wall. ex Royle, t. 38, fig. 2, a–f (Sept. 1834).

Chaptalia gossypina Royle, t. 59, fig. 2, a–d (April 1835).

Cimicifuga frigida Royle, t. 14, fig. a–i (Sept. 1833).

Circaea cordata Royle, t. 43, fig. 1, a–i (Sept. 1834).

Cissus capreolata Royle, t. 26, figs. 2, a, b, 2* (March 1834).—Reduced by Planchon in DC. Monogr. **5,** pt. 2, 433, to *Tetrastigma serrulatum* (Roxb.) Planch.

Cissus rosea Royle, t. 26, fig. 1, a–d, c–f (March 1834).—In the text (p. 149: 1835), Royle used the name *Vitis rosea* Royle.

Codonopsis ovata Royle, t. 69, fig. 3, a, c–e (Aug. 1835).

Codonopsis rotundifolia Royle, t. 62, fig. 2, a–c (April 1835).

Corvisartia indica [DC. ex] Royle, t. 60, fig. 1, a–c (April 1835). Name adopted by Lindley in Bot. Reg. 1842, **28**, Misc. 58. On transference to *Inula*, the species was re-named *Inula Royleana* DC. in DC. Prodr. **5**, 464 (1836), on account of the existence of *Inula indica* L. (1763).

Corydalis cashmeriana Royle, t. 16, fig. 1, a–c (Sept. 1833).

Crocus sativus var. *cashmerianus* Royle, t. 90, fig. 1, cum anal. b (May 1836).

Cucumis Hardwickii Royle, p. 220 (Aug. 1835).—The figure (t. 47, fig. 3, a), issued previously, is unaccompanied by dissections.

Cucumis pseudo-Colocynthis Royle, t. 47, fig. 2, b (Jan. 1835).

Cyananthus Wall. ex Benth. in Royle, p. 309 (May 1836).—The generic name was not validated by the appearance of the plate (t. 69, fig. 1, 2), since the genus was not monotypic.

Cyananthus integer Wall. ex Benth. l.c., p. 309 (May 1836).—The figure (t. 69, fig. 2) lacks dissections.

Cyananthus lobatus Royle, t. 29, fig. 1, a, b (Aug. 1835).—The specific epithet *lobatus* dates, for purposes of priority, from 1835, whereas the generic name was not validated until 1836.

Cyathidium Lindl. ex Royle, t. 56, fig. 2, a–d (April 1835).

Cyathidium taraxacifolium Lindl. l.c.

Daphne mucronata Royle, p. 322, t. 81, fig. 2, a–i (May 1836).

Delphinium cashmerianum Royle, t. 12, fig. 1–5 (Sept. 1833).

Dendrobium alpestre Lindl. ex Royle, t. 88, fig. 2, a–f (May 1836), non Swartz (1799).

Deutzia corymbosa Royle, t. 46, fig. 2, a, b (Jan. 1835).

Dictamnus himalayanus Royle, t. 29 (sphalm. 28), fig. 1–7 (June 1834).

Echinops nivea Wall. ex Royle, t. 56, fig. 1 (April 1835).—The figure lacks analyses, and there is no description in the text (p. 251). The valid publication of the name apparently dates from DC. in DC. Prodr. **6**, 526 (1837).

Edwardsia mollis Royle, t. 32, fig. 2, b–i (June 1834).

Elaeagnus parvifolia Wall. ex Royle, p. 323, t. 81, fig. 1, a–c (May 1836).

Epilobium laxum Royle, p. 211 (April 1835).—The figure, issued previously, lacks analyses.

Eriocaulon Sollyanum Royle, p. 409, t. 97, fig. i, a, b, d–f, i (1840). —There is no description in the text, but the name is validated by the analyses accompanying the figure. It has therefore priority over *E. trilobum* Koern. in Linnaea, **27**, 645 (1856), which has been adopted in Fl. Brit. Ind. and Engl. Pflanzenreich.

Eriocycla Lindl. in Royle, t. 51, fig. 2, a–c (Jan. 1835).

Eriocycla nuda Lindl. l.c.

Euphorbia cashmeriana Royle, p. 329, t. 82, fig. 4, a, b (May 1836).

Euphorbia humilis Royle, p. 329, t. 82, fig. 2 (May 1836).

Euphorbia nana Royle, p. 329, t. 82, fig. 3, a–c (May 1836).

Euphorbia pentagona Royle, p. 329, t. 82, fig. 1, a–e (May 1836).

Falconeria Royle, p. 354 (Febr. 1839).

Falconeria insignis Royle, p. 354, t. 98 (84a), fig. 2, a–m (Febr. 1839).

Falconeria Wallichiana Royle, p. 354 (Febr. 1839). *F. Wallichii* Royle, t. 98 (84a), fig. 3, b–f (Febr. 1839).—Since the text and plate were published together, the name in the former takes precedence.

Gagea elegans Wall. ex Royle, p. 388 (1840).—The figure (t. 95, fig. 2) lacks analyses.

Galatella (sphalm. *Galatilla*) *juncea* Lindl. ex Royle, t. 58, fig. 3 (April 1835).—The figure is unaccompanied by analyses, and there is no description in the text (p. 251). The valid publication of the name dates from DC. in DC. Prodr. **5,** 257 (1836).

Gaultheria trichophylla Royle, t. 63, fig. 3, a–e (Aug. 1835).

Gaylussacia serrata Lindl. ex Royle, p. 257, t. 79, fig. 2, a–d (Dec. 1835).—Based on *Agapetes serrata* G. Don, Gen. Syst. **3,** 862 (1834).

Genista versicolor Wall. ex Royle, t. 34, fig. 2, a–c (June 1834).—Transferred by Bentham (p. 198) to *Caragana* as *C. versicolor* Benth. (April 1835).

Gentiana contorta Royle, t. 68, fig. 3, a–c (Aug. 1835).

Gentiana coronata Royle, t. 68, fig. 1, a–c (Aug. 1835).

Gentiana kurroo Royle, t. 68, fig. 2, a, b (Aug. 1835).

Geranium Lindleyanum Royle, t. 27, fig. a–d (March 1834).

Grewia elastica Royle, t. 22, fig. 1–6 (Sept. 1833).

Gymnandra cashmeriana Royle ex Benth. Scroph. Ind. 47 (? Aug. 1835); Royle, Ill. t. 73, fig. 3, a–c (Dec. 1835).

Holostemma Brunonianum Royle, t. 66, fig. 2, sine anal. (Aug. 1835).—No description of this species was given by Royle (p. 276), as he had lost the specimens from which it was drawn. The name was validly published by Decaisne in DC. Prodr. **8,** 533 (1844).

Hordeum Aegiceras [Nees ex] Royle, t. 97, fig. 2, sine anal. (1840).—The name was not validly published, there being neither description nor analyses. The plant is now treated as a variety of *H. vulgare* L.

Impatiens bicolor Royle, t. 28, fig. 1, a–h (March 1834).

Impatiens glandulifera Royle, t. 28, fig. 2, cum nodi analysi (March 1834).—The corresponding description appeared in part V (Jan. 1835). *I. glandulifera* Royle therefore antedates *I. glandulifera* Arn. in Hook. Compan. Bot. Mag. **1,** 322, since the latter was not published until June 1836. The name *Impatiens Roylei* Walp. Rep. **1,** 475 (1842), substituted by Walpers for *I. glandulifera* Royle, was accordingly superfluous and must be rejected. *I. glandulifera* Arn., a native of Ceylon, now bears the name *I. taprobanica* Hiern (1900).

Incarvillea diffusa Royle, t. 72, fig. 1, a–l (Dec. 1835).—Antedates the name *I. arguta*, published on p. 296 (May 1836). Hence the species, now known as *Amphicome arguta* Royle ex G. Don, becomes **Amphicome diffusa** (*Royle*) *Sprague*, comb. nov.

Iris longifolia Royle, p. 372, t. 91, fig. 2, a–c (Febr. 1839).—A later homonym of *I. longifolia* Schneev. (1793).

Isopyrum microphyllum Royle, t. 11, fig. 4, a, b (Sept. 1833).—Now placed in the genus *Paraquilegia* as *P. microphylla* (Royle) J. R. Drumm. et Hutch.

Kohautia coccinea Royle, t. 53, fig. 1, a–e (Jan. 1835).

Lantana dubia Wall. ex Royle, p. 300 (May 1836).—The figure (t. 73, fig. 2) has no analyses.

Leucostemma angustifolium Royle, t. 21, fig. 2, a–e (March 1834).—The species is now known as *Stellaria Webbiana* (Benth.) Edgew. et Hook. f.

Ligularia arnicoides [DC. ex] Royle, t. 60, fig. 2, a, b (April 1835). The valid publication of the name dates from Royle's "Illustrations," not from DC. Prodr. **6,** 314 (1837), as generally cited.

Lilium Thomsonianum Royle, t. 92, fig. 1, a–c (Febr. 1839).—*Fritillaria Thomsoniana* D. Don in Royle, p. 388 (1840).

Lloydia himalensis Royle, t. 93, fig. 2, a, b (Febr. 1839).

Lloydia kunawurensis Royle, t. 93, fig. 3, a–c (Febr. 1839).

Lonicera bracteata Royle, t. 53, fig. 2, a–e (Jan. 1835).

Lychnis fimbriata Wall. ex Royle, t. 20, fig. B, 1, 2 (March 1834).—Treated as a variety of *Lychnis indica* (Roxb.) Benth. in Fl. Brit. Ind. **1,** 225.

Lythrum cashmerianum Royle, t. 44, fig. a–g (Sept. 1834).

Meconopsis aculeata Royle, p. 67 (March 1834).—The plate (t. 15) is without analyses.

Morina Wallichiana Royle, t. 55, fig. 1, e–f (April 1835).

Mulgedium macrorhizum Royle, t. 61, fig. 1, a–c (April 1835).

Mulgedium sagittatum Royle, t. 61, fig. 2, a–c (April 1835).

Murdannia Royle, p. 403 (1840).—The new generic name *Murdannia* was not validated by the provision of a figure with analyses, since the genus, although monotypic, was not based on a new species.

Murdannia scapiflora Royle, p. 403 (1840).—A new combination for *Commelina scapiflora* Roxb. The combination *Murdannia scapiflora* appeared on t. 95, fig. 3 (Febr. 1839), but was there unaccompanied by any reference, either direct or implied, to the synonym on which it was based; the valid publication dates from the issue of the corresponding text, p. 403.

Myricaria bracteata Royle, t. 44, fig. 2, a–c (Sept. 1834).

Olea ferruginea Royle, t. 65, fig. 1, a–g (Aug. 1835).

Osmorrhiza laxa Royle, t. 52, fig. 1, a–b (Jan. 1835).

Parnassia nubicola Wall. ex Royle, t. 50, fig. 3, a–g (Jan. 1835).—Royle's description (p. 227) followed in Aug. 1835. The species is cited in Fl. Brit. Ind. **2,** 402 from Wight, Ill. [**1,** 45] t. 21 (1840).

Picrorhiza kurrooa Benth. Scroph. Ind. 47 (? Aug. 1835); Royle, t. 71, fig. 2, a–c, e–g (Dec. 1835).—Bentham cited Royle's figure, of which he had doubtless seen a proof. On p. 55 of his Scrophularineae Indicae is a postscript written in July 1835, and it is therefore probable that the pamphlet appeared in August of that year. The title page bears the date 1835.

Pinus khutrow Royle, t. 84, fig. 1, a–d (May 1836).

Polygala furcata Royle, t. 19, fig. B, 1–4 (March 1834).—This antedates *P. glaucescens* Wall. ex Royle, p. 76 (June 1834), which A. W. Bennett (Fl. Brit. Ind. **1**, 201) reduced to *P. triphylla* Ham. ex D. Don (1825), as a variety. Chodat (Monogr. Polygal. 41) does not even recognize the variety.

Polygala myrsinites Royle, t. 19, fig. A, 1–3 (March 1834).—This antedates the name adopted in the text, *P. elegans* Wall. ex Royle, p. 76 (June 1834), which is regarded as a distinct species by Chodat (Monogr. Polygal. 350).

Populus ciliata Wall. ex Royle p. 346, t. 98 (84a), fig. 1 (Febr. 1839).

Potentilla Cautleyana Royle, p. 207 (April 1835).—The corresponding figure (t. 40, fig. 1), published in Sept. 1834, is without analyses.

Potentilla Inglisii Royle, p. 207 (April 1835).—The figure (t. 41, fig. 3), issued previously, lacks analyses.

Potentilla pteropoda Royle, p. 207 (April 1835).—The figure (t. 40, fig. 2), issued in Sept. 1834, lacks analyses.

Potentilla Saundersiana Royle, p. 207 (April 1835).—The figure (t. 40, fig. 1), published previously, lacks analyses.

Primula elliptica Royle, t. 76, fig. 2, anal. 1–2 (Dec. 1835).

Primula obtusifolia Royle, p. 311 (May 1836).—The figure (t. 77, fig. 1) lacks analyses.

Primula purpurea Royle, p. 311 (May 1836).—The figure (t. 77, fig. 2) lacks analyses.

Primula rosea Royle, t. 76, fig. 1, anal. 1–3 (Dec. 1835).

Prinsepia Royle, t. 38, fig. 1, a–g (Sept. 1834).—The generic name was validated by the figure and analyses. The corresponding description (p. 206) did not appear till April 1835.

Prinsepia utilis Royle, t. 38, fig. 1, a–f (Sept. 1834).

Procris obtusa Royle, t. 83, fig. 3, cum anal. (May 1836).—Not mentioned in the text of Urticeae (pp. 333–335). Reduced to *Lecanthus peduncularis* (Royle) Wedd. in DC. Prodr. **16,** pt. 1, p. 164 (1869).

Procris peduncularis Royle, t. 83, fig. 2, cum anal. (May 1836).—Not mentioned in the text of Urticeae. Now placed in the genus *Lecanthus*, as *L. peduncularis* (Royle) Wedd.

Procris racemosa Royle, t. 83, fig. 1, cum anal. (May 1836.)—Name not mentioned in the text of Urticeae (pp. 333–335). Reduced to *Pilea Wightii* Wedd. by Weddell in DC. Prodr. **16,** pt. 1, p. 194 (1869), and treated in Fl. Brit. Ind. **5,** 555 (1888), as a variety of that species, var. *Roylei* Hook.

Pycnocycla Lindl. t. 51, fig. 1, a–h (Jan. 1835).

Pycnocycla glauca Lindl. l.c.

Quercus dealbata Royle, t. 84, fig. 2 (May 1836).—This was an error for *Q. dilatata*, and was corrected in copies issued subsequently. The figure is unaccompanied by analyses, and there is no description in the text (p. 346). The name *Q. dilatata* Lindl. was, however, validly published by Alph. DC. in DC. Prodr. **16**, pt. 2, p. 41 (Nov. 1864).

Ranunculus polypetalus Royle, p. 54 (March 1834), non Raf. (1817). —The figure (t. 11, fig. 2) is without analyses.

Rheum spiciforme Royle, t. 78, fig. 1–5 (Dec. 1835).

Rheum Webbianum Royle, p. 318 (May 1836).—The figure (t. 99 or 78a) did not appear until Febr. 1839.

Rosa Webbiana Wall. ex Royle, p. 208 (April 1835).—The figure, published previously, lacks analyses.

Roscoea alpina Royle, t. 89, fig. 1, a–k (May 1836).

Roscoea lutea Royle, t. 89, fig. 2, a–l (May 1836).

Roscoea purpurea Royle, t. 89, fig. 3, a–e (May 1836), non Sm. (1806).

Saxifraga ciliata Royle, p. 227 (Aug. 1835).—The corresponding figure (t. 49, fig. 2) is without dissections.

Saxifraga imbricata Royle, p. 226 (Aug. 1835).—The figure (t. 49, fig. 1) lacks dissections.

Saxifraga spinulosa Royle, t. 50, fig. 2, a–e (Jan. 1835).—Antedated by *S. spinulosa* Adams (1817). Hence the name *S. mucronulata* Royle was substituted by Royle, p. 227 (Aug. 1835).

Saxifraga stenophylla Royle, p. 227 (Aug. 1835).—The figure (t. 50, fig. 1) has no dissections.

Scabiosa speciosa Royle, t. 55, fig. 2, a–d (April 1835).

Sedum azureum Royle, p. 222 (Aug. 1835).—The figure (t. 48, fig. 2) has no dissections.

Sedum coccineum Royle, p. 223 (Aug. 1835).—The figure (t. 48, fig. 3), has no dissections.

Sedum linearifolium Royle, p. 222 (Aug. 1835).—The figure (t. 48, fig. 1) has no dissections.

Sibbaldia purpurea Royle, t. 40, fig. 3, a, b, e–g (Sept. 1834).

Sieversia elata Royle, t. 39, fig. 1, a–b (Sept. 1834).

Silene Falconeriana Royle, t. 20, fig. A, 1–3 (March 1834).

Smilax Villandia Ham. ex Royle, p. 384, t. 94, fig. 2 (Febr. 1839).

Smithia ciliata Royle, t. 35, fig. 2, a, b (June 1834).

Sonerila tenera Royle, t. 45, fig. 2, a–e (Sept. 1834).

Swertia alternifolia Royle, t. 67, fig. 2, a (Aug. 1835).

Swertia caerulea Royle, t. 67, fig. 1, a–d (Aug. 1835).

Syringa emodi Wall. ex Royle, t. 65, fig. 2, a–c, e, f (Aug. 1835). —Antedates the description in G. Don, Gen. Syst. **4**, 51 (1837).

Thermopsis barbata Royle, t. 32, fig. 1, a–m (June 1834).

Thibaudia variegata (Roxb.) Royle, p. 257, t. 79, fig. 1, a–e (Dec. 1835).—Based on *Ceratostema variegatum* Roxb. Fl. Ind. **2**, 413 (1832). The name *Thibaudia variegata* was published by Royle as a new combination for *Ceratostema variegatum* Roxb., and must under

International Rules be treated as a synonym of that species, although the plant figured by Royle is referred by C. B. Clarke to another species, as *Agapetes setigera* var. *Roylei* (Kurz) C. B. Clarke (Fl. Brit. Ind. **3**, 443).

Trillium Govanianum Wall. ex Royle, p. 384 (1840).—The figure (t. 93, fig. 1) has no dissections.

Uvularia Leschenaultiana Wall. ex Royle, t. 96, fig. 2, a–d (Febr. 1839).—The name adopted in the text, p. 386 (1840), is *Disporum Leschenaultianum* (Royle) D. Don in Proc. Linn. Soc. **1**, 45 (1839).

Viola kunawarensis Royle, p. 75 (March 1834). The figure (t. 18, fig. 3) is unaccompanied by analyses.

XLVIII—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA: XVII.* THE GENUS STRYCHNOS IN BRITISH GUIANA AND TRINIDAD. N. Y. SANDWITH.

Thanks chiefly to recent efforts of the Forest Department of British Guiana, much material of this genus, so well-known for its poisonous and medicinal properties, is now available for examination and it is possible to provide a fairly comprehensive account of the species occurring in this Colony and in Trinidad. Nine species are now known in British Guiana, one of which is the solitary representative of the genus in Trinidad. This number compares favourably with the eight recorded from Venezuela (*Bredemeyeri, curare, Fendleri, Gubleri, guianensis, panurensis, syntoxica, toxifera*), and still more so with the lonely Surinam species (*guianensis*); but it is clear that these totals are purely due to accident, since the distribution of bush-ropes with uncertain flowering seasons in the vast forest areas of tropical America must remain for many years a subject for speculation.

Thus five of the nine species discussed below are at present only known from British Guiana, but there is no reason to suppose that they do not occur outside the colony, nor can a definite habitat within its boundaries be assigned with confidence to any of the nine. *S. tomentosa*, a supposed endemic, grows both in the far interior and in the coastal rain forest, and the same may be said of *S. toxifera*, which extends to Panama; while *S. pedunculata*, which is well-known in the savannah districts of Pirara and Roraima, re-appears in Trinidad. Again, *S. Melinoniana* was described from French Guiana, but has not yet been collected in the intervening region of Surinam.

All the species belong to the morphological type which climbs by tendrils; none of the spiny, bushy, type which is plentiful in Brazil and Eastern Peru has yet been found in the savannah districts of British Guiana. The best characters are to be found in the position of the inflorescence, in the indumentum of the leaves and young branchlets, the length of the corolla relative to the calyx, and the shape and

---

*Continued from *K.B.* 1933, 339.

indumentum of the calyx lobes. The size and texture, and even the shape, of the leaves of plants which climb in every possible situation and to every attainable height are naturally variable on different branches, according to age; of the species here considered only *S. guianensis* can be said to bear uniformly small leaves. The venation of the leaves can only be used for distinguishing the species after considerable experience with much material of all of them. The inner pair of nerves has been proved, in the same collection of *S. Melinoniana*, to arise both from the base of the leaf and far above it. On the other hand, the intricacy of the reticulation, though impossible to define on paper, and the presence or absence of verrucular dots, have been found to be valuable and apparently reliable characters. Finally, it is of interest to note that all the species (flowers are unknown in *S. cogens*) have a glabrous ovary and style except *S. Melinoniana*, in which the ovary is whitish-pilose in the upper half and the style pilose at the base. It is unfortunate that the ripe fruits, which differ greatly in size, are for the most part unknown.

The following examination of these species includes four points which may be considered of some importance as a contribution to the study of *Strychnos* in tropical America :—

(*a*) The true specific affinity, in the section *Longiflorae*, of the very rare species, *S. cogens*, is indicated.

(*b*) The supposed endemic, *S. trinitensis*, of Trinidad, is reduced to *S. pedunculata*.

(*c*) The composite nature of *S. smilacina* Benth. is discussed and it is shown that the greater part of Bentham's description is based on the type collection of the previously described *S. Mitscherlichii* Rich. Schomb. The trivial *smilacina* is accordingly not adopted for any plant occurring in this area.

(*d*) The combination *S. guianensis* (Aubl.) Baill. is upheld as the correct name for the plant which is so often called *S. Rouhamon* Benth.

KEY TO THE SPECIES OF STRYCHNOS OCCURRING IN BRITISH GUIANA AND TRINIDAD.

Branchlets ascending-pilose and puberulous; leaves very finely and densely granular-punctate above, glabrous on both surfaces except for the margins and principal nerves which are distinctly pilosulous, especially on the lower surface, sometimes glabrous on the upper surface with age; inflorescence unknown (probably terminal) ....1. *cogens*.

Species without such a combination of characters on branchlets and leaves :

- Inflorescences terminal or axillary; corolla tube longer than the lobes, usually conspicuously so (Section *Longiflorae* Progel) :
  - Leaves with conspicuous indumentum; inflorescences terminal :
    - Branchlets and leaves with long spreading hairs; calyx lobes linear-lanceolate...2. *toxifera*

Branchlets and leaves with short adpressed hairs :

Leaves 1–3·6 cm. broad, densely woolly beneath ; calyx lobes ovate ; corolla tube 12 mm. long or more ; stamens exserted..3. *tomentosa.*

Leaves 3–8 cm. broad, densely softly pubescent beneath ; calyx lobes lanceolate ; corolla tube 8 mm. long ; stamens included.....................................4. *diaboli*

Leaves glabrous, or very minutely sparsely pubescent beneath ; inflorescences axillary :

Leaves granular-punctate above (cf. *S. cogens*), sparsely but regularly very minutely pubescent beneath ; calyx lobes deltoid-triangular, acute, fulvous-puberulous outside......... 5. *Erichsonii.*

Leaves not granular-punctate above, glabrous beneath ; calyx lobes ovate to ovate-lanceolate, blunt, pubescent, or glabrous and ciliate outside :

Leaves firmly chartaceous, scarcely coriaceous, very intricately reticulate ; rhachis and main branches of inflorescence strongly pubescent ; calyx lobes ciliate and pubescent on the outer surface......................... 6. *pedunculata* (*trinitensis*).

Leaves coriaceous, not very intricately reticulate ; rhachis and main branches of inflorescence glabrous ; calyx lobes conspicuously ciliate, but otherwise glabrous......... 7. *Mitscherlichii* (*smilacina*).

Inflorescences axillary ; corolla tube equalling or shorter than the lobes (Section *Intermediae* Solereder ; section *Rouhamon* Progel) :

Branchlets glabrous ; leaves large, 7·5–20 cm. long, 3·5–10 cm. broad, glabrous ; corolla densely pulverulent-tomentellous outside...8. *Melinoniana.*

Branchlets densely adpressed-tomentose : leaves small, up to 7 cm. long and 3 cm. broad, pubescent beneath and barbate-pilose in the axils of the inner principal nerves ; corolla glabrous outside to the naked eye...9. *guianensis* (*Rouhamon*).

1. **S. cogens** *Benth.* in Hook. Journ. Bot. **3,** 241 (1841) ; Rob. Schomb. in Ann. Nat. Hist. **7,** 411, 417, 421 (1841) ; DC. Prodr. **9,** 16 (1845) ; Benth. in Journ. Linn. Soc. **1,** 105 (1857) quoad exemplum Schomburgkianum tantum ; Progel in Mart. Fl. Bras. **6,** pars 1, 275 (1868) partim quoad exemplum Schomburgkianum tantum, excl. descr. inflorescentiae ; Klotzsch in Rich. Schomb. Reisen, **3,** 1143 (1848) ; Rich. Schomb. Reisen, trans. Roth, **1,** 352–3 (1922).

Uppermost youngest branchlets thin, both pubescent and pilose. *Leaves* ovate to ovate-lanceolate, gradually attenuate to an acuminate apex, rounded or obtuse at the base, 7·5–14 cm. long, 3·3–6·5 cm. wide, chartaceous, olive-green, more or less opaque, quintuplinerved, the inner pair leaving the costa 2–5 mm. above the base, minor venation and granular punctation exceedingly fine above, reticulation more open and conspicuous beneath; indumentum as given in the key; petiole 3–5 mm. long, with the indumentum of the branchlets, glabrescent with age. *Flowers* and fruit unknown.

BRITISH GUIANA. On the edges of oases (fide Klotzsch), near Pirara (fide Progel), *Rob. Schomburgk* 156 (Kew, type ! Brit. Mus. ! Cambridge !).

Vernacular name, "Arimaru."

The Spruce collection (no. 2634) from the Rio Uaupés, which bears axillary inflorescences and which was referred to this species by Bentham himself, in his paper in the Journal of the Linnean Society, and by Progel in the Flora Brasiliensis, is completely distinct from *S. cogens*; it was described as *S. panurensis* Sprague et Sandwith in Kew Bull. 1927, 132, and its affinity is certainly with *S. Mitscherlichii* Rich. Schomb. (*S. smilacina* Benth.). The sterile Martin collection from Cayenne, which was also referred to *S. cogens* by Bentham in the same paper, equally lacks the characteristics of that species.

Careful comparison of the indumentum and foliage characters of the solitary collection of *S. cogens* with those of other tropical American species has revealed a definite, and perhaps close, affinity with *S. panamensis* Seem., and a less clear resemblance to *S. tabascana* Sprague et Sandwith and *S. triplinervia* Mart. Since these three species belong to the section *Longiflorae* and bear terminal inflorescences, the nature of those of *S. cogens* may now fairly be assumed to be the same. This discovery is of some interest, since Progel, on the evidence of *Spruce* 2634 (*S. panurensis*), placed *S. cogens* in the section of his key comprising species with axillary inflorescences.

S. cogens, "Arimaru," is repeatedly mentioned by the Schomburgks as one of the ingredients in the manufacture of the Macusi arrow-poison Urari at Pirara. Robert Schomburgk (Ann. Nat. Hist. **7**, 420, 421) writes that when he visited Esmeralda in 1839 he showed his herbarium specimens of *S. cogens* to the natives, and they recognised them as belonging to the plant from which they made their Cumarawa, a poison distinct from and inferior to their Curare (Urari). The Curare of Esmeralda, which has been made so famous by Humboldt's account, was not prepared from *S. toxifera*, which Robert Schomburgk says was unknown to these natives, but from *S. curare* (H.B.K.) Benth. (*Lasiostoma? curare* H.B.K.). Fragmentary material of the type of this species has recently been examined in the Paris Herbarium, and it appears to be allied to *S. guianensis* (Aubl.) Baill. (*S. Rouhamon* Benth.).

The rediscovery of *S. cogens* in flowering condition would be of the greatest importance and interest in view of all that has been written about it in the past.

2. **S. toxifera** *Rob. Schomb. ex Benth.* in Hook. Journ. Bot. **3**, 240 (1841); ex Hook. in Hook. Ic. Pl. 364, 365 (1841); in Ann. Nat.

Hist. **7**, 411, tt. 12, 13 (1841), and in Pharmaceutical Journal, April 1857; Reisen, 97, 331 (1841), trans. Roth, 37, 121 (1931); A. DC. in DC. Prodr. **9**, 16 (1845); Walp. Ann. Bot. **1**, 512 (1849); Benth. in Journ. Linn. Soc. **1**, 104 (1857); Progel in Mart. Fl. Bras. **6**, pars. 1, 271, pl. 73, f. i (1868); M. G. Planchon in Journ. Pharm. et Chim. **5**, 5–6 (1882); Klotzsch in Rich. Schomb. Reisen, **3**, 950 (1848); Rich. Schomb. Reisen, trans. Roth, **1**, cap. ix, passim (1922); Standley in Contr. U.S. Nat. Herb. **27**, 302 (1928).

Leaves membranaceous to thinly chartaceous, very variable in shape and size, not exceeding 16 cm. in length and 7 cm. in width, 5–7-plinerved, inner pair of nerves usually arising far above the base; petiole up to 5 mm. long, with spreading rusty hairs. *Inflorescences* rather loosely corymbose-thyrsoid, up to 3·5 cm. in diameter, densely pilose. *Calyx* lobes 3–4 mm. long, up to 0·6 mm. broad. *Corolla* tube up to 16 mm. long, often much shorter, shortly pulverulent-tomentose outside and densely pilose with long, spreading to ascending, straw-coloured hairs, whitish-woolly in the centre but otherwise glabrous within; lobes whitish-woolly at the base and at the incurved tips, otherwise pulverulent. *Stamens* exserted, filaments scarcely 0·5 mm. long. *Ovary* and style glabrous. *Fruit* like an apple, 6–7 cm. diameter.

BRITISH GUIANA. Kanaku Mountains, 900 m., fruiting, Dec. 1835, *Robert Schomburgk* 155 (Kew, type! Brit. Mus! Paris! Oxford, without number! Cambridge, without number! Berlin.); also seen by him in fruit in June, 1838. Ilamikipang, Kanaku Mountains, 1842, *Richard Schomburgk* 637 (Berlin, fide Progel). Mount Iramaikpang, Kanaku Mountains, 400 m., Aug. 1932 (sterile), *Fr. Mather S. J.* in *Forest Dept.* record no. 2301 (Kew!). Banks of the Sururu River and Pomeroon River, near sea-level, fl. Sept. 1843, *Robert Schomburgk* 769 and 770, *Richard Schomburgk* 1465 and 1448 (Kew! Brit. Mus! Paris! Cambridge! Berlin.). Arunamai Creek, Pomeroon River, fl. March, 1932, *Davis* in *Forest Dept.* record nos. 2278, 2285 (Kew!); small bush-ropes, 2½–5 in. in girth, fl. greenish-white. Anabisi River, North-west District, fl. Feb. 1922, *la Cruz* 1358 (New York!). Upper Rupununi River, near Dadanawa, June 1922, *la Cruz* 1495 (New York!).

Distr. Venezuela; Maypures, *Crevaux*, fide Planchon l.c. Panama Canal Zone, *Pittier* 2666 (Brit. Mus!). According to Standley the species is not found north of Costa Rica and ranges southward to Brazil, but this requires to be proved by the collection of further material, and not by mere reliance on the names Urari or Curare, which are sometimes applied to other species. A very closely allied species, *S. syntoxica* Sprague et Sandwith in Kew Bull. 1927, 129, was collected by Spruce at the foot of the Cerro Imei, Rio Pacimoni, in Amazonian Venezuela; it was said to be used by the Cunipusana Indians in the fabrication of Curare.

Vernacular names, "Wourali," "Urari," "Curare," "Devil-doer."

The three varieties *acuminata*, *obliqua* and *latifolia*, which were named by Klotzsch and described by Progel in the Flora Brasiliensis, were based on the shape of the leaves and do not appear to have any taxonomic value whatever.

For the history and uses of Urari or Curare, and the part which is played by this species in its fabrication, see the above writings of the Schomburgks and Planchon. " Ourari " was apparently first mentioned as an arrow-poison by Sir Walter Raleigh in 1595. The poison extracted from the bark of *S. toxifera* is of a peculiar deadliness and it was the frequency of this species in the Kanaku Mountains which was responsible for the fame of the Urari which was prepared by the Macusi Indians at such centres as Pirara. Thus Richard Schomburgk, in a paper read before the Philosophical Society in April 1866, wrote, " This renowned strength of the Urari of the Macusi Indians brings whole caravans of Indians from the Rio Negro, Orinoco, and even from the Amazon River to the Canuku (Kanaku) Mountains, to exchange the Urari with the inhabitants for other articles."

3. **S. tomentosa** *Benth.* in Journ. Linn. Soc. **1,** 104 (1857) ; Progel, l.c. 271 ; Sandwith in Hook, Ic. Pl. 3175 (1932).—*S. rhexioides* Klotzsch, l.c. 1144, nomen.

Leaves of flowering branchlets membranaceous, opaque, ovate to elliptic or oblong, 5–7-plinerved, principal nerves almost equidistant in the middle of the leaf ; petiole fulvous-pubescent like the branchlets, up to 5 mm. long. *Inflorescences* rather loosely corymbose-thyrsoid, up to 4·5 cm. in diameter, adpressed fulvous-pubescent. *Calyx* lobes up to 2·5 mm. long and 1·5 mm. broad. *Corolla* tube fulvous-pilosulous outside, and with a conspicuous series of long spreading hairs simulating those of *S. toxifera*, within densely woolly above, glabrous below, produced within at the apex into a whitish-woolly corona ; lobes shortly whitish-woolly and pulverulent within. *Ovary* and style glabrous. *Fruit* not seen.

British Guiana. On stony wooded slopes near Pirara, 1843, fl. Dec.–Jan. (fide Klotzsch), *Robert Schomburgk* 2nd coll. 723 (*Richard Schomburgk* 1095) (Kew, type ! Paris ! Cambridge ! Berlin.). In mixed forest on hill, Moraballi Creek, Essequibo River, Oct. 1929, *Sandwith* 524 (Kew ! Distributed to New York, Washington, Rio de Janeiro, Paris, Berlin, Geneva, Stockholm, Utrecht, Leningrad).

Distr. Endemic ?

4. **S. diaboli** *Sandwith* in Kew Bull. 1931, 486 ; in Hook. Ic. Pl. 3175 (1932).

Leaves of flowering branchlets thinly chartaceous, broadly ovate or ovate-elliptic to suborbicular, usually 7-plinerved, nerves not equidistant ; petiole fulvous-tomentose like the branchlets and tendrils, 2–6 mm. long. *Inflorescences* dense-flowered, 2–4 cm. in diameter, fulvous-tomentose. *Calyx* lobes 2 mm. long, scarcely 1 mm. broad. *Corolla* tube fulvous-tomentose outside, without a series of spreading hairs, within glabrous at the base and apex, otherwise adpressed-pilose; lobes clothed at the base within with dense white wool, otherwise pulverulent-tomentellous. *Ovary* and style glabrous. *Fruit* unknown.

BRITISH GUIANA. In dense forest, Moraballi Creek, Essequibo River, Aug. 1929, *Sandwith* 109 (Kew, type! Distributed to New York, Washington, Rio de Janeiro, Paris, Berlin, Geneva, Stockholm, Utrecht, Leningrad). Mazaruni Station, fl. July-Aug, 1932, *Forest Dept.* record nos. 2295, 2297 (Kew !); bushrope with smooth, dark reddish-brown bark.

Arawak name, "Black Devil-doer."

Distr. Endemic?

The two recent collections from the Mazaruni Station are of great value since they include old fully-developed leaves from sterile branches. These are green and subcoriaceous, up to 13 cm. long and 8 cm. broad, glabrescent above except on the nerves, but still strongly pubescent beneath, while the branchlets and petioles remain tomentose.

5. **S. Erichsonii** *Rich. Schomb. ex Progel* in Mart. Fl. Bras. **6**, pars. 1, 274 (1868); Rich. Schomb. Reisen, **3**, 1082 (1848), nomen.

Old branchlets with a grey cortex and large, closely-set lenticels; young branchlets pruinose, glabrous. *Leaves* oblong-lanceolate or elliptic-oblong, attenuate at both ends, 6–11 cm. long, up to 3·7 cm. wide, shining, thinly coriaceous, usually drying a rather yellowish green, 5–7-plinerved, intricately reticulate on both surfaces; petiole glabrous, 3–6 mm. long; tendrils pruinose, very minutely pubescent or glabrescent. *Inflorescences* pubescent, narrowly thyrsoid with opposite cymes, up to 2·5 cm. long. *Calyx* lobes deltoid-triangular, acute, up to 1 mm. long and hardly 1·2 mm. wide, densely minutely fulvous-puberulous all over the outer surface. *Corolla* tube narrowly cylindrical, up to 8 mm. long, densely granular-papillose outside, glabrous within near the base otherwise densely pubescent; lobes narrow, 3 mm. long, densely woolly within in the lower half, otherwise granular-papillose. *Stamens* with very short filaments, hidden in the wool at the throat of the corolla. *Ovary* and style glabrous. *Fruit* not seen.

BRITISH GUIANA. Upper Corentyne River, fl. July–Oct. 1843, *Robert Schomburgk* 1580 (isotype, Berlin !), and 46 of "last small set" (Kew !). Borders of forest, Roraima, fl. January, *Richard Schomburgk* (type, Berlin ?). The following sterile specimens with large leaves agreeing in essentials with those of this species may be referred here: Arunamai Creek, Pomeroon River, March 1932, *Davis* in *Forest Department* no. 2284 (Kew !); Issororo Creek, Pomeroon River, Feb. 1932, *Davis* in *Forest Department* no. 2259 (Kew !).

Distr. Endemic? Specimens recently distributed under this name from Brazil (Pará, *Ducke* 18536, 18538) cannot possibly be identified with the authentic material of *S. Erichsonii*, although they represent an allied species. They are immediately distinguished from *S. Erichsonii* by the pilosulous (not papillose) corolla tube and by the lobes being woolly all over the inner surface.

The combination of a granular-verruculose upper leaf-surface with minute scattered pubescence on the lower surface is present in other species of *Strychnos*, as is shown by the Brazilian specimens which have been wrongly referred to *S. Erichsonii* and by similar material from British Honduras distributed as *S. Peckii* Rob.

6. **S. pedunculata** (*DC.*) *Benth.* in Journ. Linn. Soc. **1,** 105 (1857); Progel in Mart. Fl. Bras. **6,** pars 1, 275 (1868).—*Rouhamon pedunculatum* DC. Prodr. **9,** 561 (1845). *Strychnos Schomburgkiana* Klotzsch in Rich. Schomb. Reisen, **3,** 1144 (1848), nomen; vide etiam Rich. Schomb. Reisen, trans. Roth, **2,** 140 (1923). *S. trinitensis* Griseb. Fl. Brit. W. Ind. 407 (1861).

Young branchlets pubescent or becoming glabrous. *Leaves* ovate to elliptic-oblong or oblong-lanceolate, shortly obtusely acuminate at the apex, abruptly cuneate at the base, 4–12 cm. long, 2–6 cm. wide, shining, firmly chartaceous to thinly coriaceous, 5-plinerved, intricately reticulate on both surfaces; petiole minutely pubescent, becoming glabrous, up to 7 mm. long. *Inflorescences* pubescent, narrowly thyrsoid with opposite cymes, up to 4·5 cm. long; pedicels 1–3 mm. long. *Calyx* lobes unequal, ovate or rather narrowly ovate-lanceolate, blunt, up to 1·3 mm. long, 0·6–1 mm. wide, thinly pubescent on the outer surface, ciliate. *Corolla* tube very slender and narrowly cylindrical, up to 6 mm. long, sometimes only 3 mm. long, very minutely papillose outside and often seeming almost glabrous, glabrous within towards the base otherwise rather thinly pilosulous; lobes narrow, scarcely 3 mm. long, densely woolly within in the lower third, otherwise granular-papillose. *Stamens* subsessile, included, inserted below the wool at the throat of the corolla. *Ovary* and style glabrous, style rather short during the flowering season. *Fruit* not seen.

British Guiana. Roraima, fl. Nov., *Schomburgk* 482=792 B (isotype, Kew! Brit. Mus.! Cambridge! Paris! Berlin.). Cotinga River, W. of Pirara, fl., *Richard Schomburgk* sine numero (Kew! Cambridge! Paris, sub no. 792! Berlin.). Rupununi Savannahs, Pirara, fl. Sept. 1931, *Davis* in *Forest Department* no. 2184 (Kew!): a bush-rope in savannah forest; flowers white, sweet-scented.

Trinidad. Caura, fl. Sept. 1849, *Crueger* (type or isotype of *S. trinitensis*, Kew!).

Arawak name, " Devil-doer." Richard Schomburgk mentions this species as providing, under the name " Yakki," an ingredient of the arrow-poison of the Macusi Indians.

Distr. British Guiana and Trinidad.

The material collected by Davis, when he rediscovered this rare species, is of value since it proves that the corolla may be much longer than was shown by Schomburgk's specimens at Kew, which otherwise agree with his in every respect. From the measurements

(1½ lines) given by Progel in the Flora Brasiliensis, it is evident that the Berlin material of the Schomburgk collections bears equally short corollas, but De Candolle originally described the corolla tube of Schomburgk 482 at Geneva as 3 lines long. Progel, in any case, was quite wrong in placing this species in his section *Rouhamon*.

S. trinitensis, whose affinity with *S. pedunculata* was indicated by Solereder in Engl. Pflanzenfam. iv, 2, 39 (1895), is quite evidently conspecific with it; the distance between the Trinidad locality and those in the interior of British Guiana shows how dangerous it is to describe new endemics from material collected from bush-ropes.

7. **S. Mitscherlichii** *Rich. Schomb.* Reisen, **2,** 451 in obs. (1848); reimpr. in Walp. Ann. **1,** 512 (1849).—*S. smilacina* Benth. in Journ. Linn. Soc. **1,** 105 (1857), pro majore parte, excl. spec. Martin.; Progel in Mart. Fl. Bras. **1,** pars. 1, 274 (1868).

Branchlets glabrous or only very minutely puberulous. *Leaves* broadly ovate to elliptic or oblong, rarely less than 9 cm. long, usually much longer (up to 20 cm.), 3·5–9 cm. wide, shining, coriaceous, conspicuously or inconspicuously quintuplinerved, strongly but not very closely reticulate; petiole glabrous, blackish in dried material, 5–12 mm. long. *Inflorescences* with black glabrous main branches, narrowly thyrsoid with opposite cymes, up to 4 cm. long. *Calyx* lobes unequal, ovate, blunt, up to 1·3 mm. long and 1 mm. wide, strongly conspicuously ciliate, otherwise glabrous. *Corolla* tube narrowly cylindrical, 5–7 mm. long, papillose outside, glabrous within near the base otherwise pilosulous; lobes narrow, 2–3 mm. long, densely woolly within in the lower third, otherwise papillose. *Stamens* as in *S. pedunculata*. *Ovary* and style glabrous. *Ripe fruit* not seen.

British Guiana. Barama River, fl. Sept.–Oct., *Schomburgk* 775, *Robert*, and 1516B, *Richard* (Kew! Brit. Mus! Paris! Berlin.). Issororo Creek, Pomeroon River, sterile, Feb. 1932, *Davis* in *Forest Department* no. 2261 (Kew!). Demerara River, fl. June, *Jenman* 5031 (Kew! New York!), fl. Sept., *Jenman* 3972 (Kew! New York!). Malali, Demerara River, fl. Oct.-Nov., *la Cruz* 2731 (Kew!). Bonasika Creek, Essequibo River, fr. March, *C. W. Anderson* 298 (Kew!). Upper Mazaruni River, fl. Sept.–Oct., *la Cruz* 2397 (Kew!). *Altson* 441, a sterile plant from Bunsikai Creek, Iruau Creek, North-west District, called "Guanaparu" or "devil-doer" by the Arawaks, seems to belong here (Kew!).

Distr. Endemic? The sterile Burchell collection from Pará, which was cited by Progel under *S. smilacina*, may perhaps be placed under this species.

Bentham based the description of his *S. smilacina* on two collections, *Robert Schomburgk* 775 (*Richard Schomburgk* 1516) and a *Martin* collection in Cayenne. Of these, the Schomburgk collection bears flowers, whereas the Martin sheets are flowerless, while the description of the leaves, inflorescences and calyx lobes is evidently compiled from both. Thus the Schomburgk collection has the better claim to be the type of S. *smilacina*, since the description of the corolla can apply to it alone. But the Schomburgk collection is clearly the type collection of S. *Mitscherlichii* which was legitimately, though inadequately, described several years previously by Richard Schomburgk in a footnote in his " Travels." This footnote was omitted by Roth in his English translation, but it was reprinted by Walpers a year after the date of its original publication. The description of the calyx lobes and corolla would leave little doubt as to the identification, even it if had not already been published by Progel in his account of the genus in the Flora Brasiliensis where, however, S. *Mitscherlichii* is treated as a synonym of S. *smilacina*. Bentham himself was unable to identify Schomburgk's species with this collection and placed it, with doubt, between S. *brevifolia* Spruce and S. *hirsuta* Spruce in his monograph, see Journ. Linn. Soc. **1**, 106. Before adding the footnote with the description Richard Schomburgk wrote of this species, " A glorious *Strychnos* with its large leathery shining leaves and fragrant smell attracted my attention : it was new, and in honour of the celebrated chemist, Mitscherlich, I called it *Strychnos Mitscherlichii* " (Roth's translation, **2**, 360).

Careful examination of the two Martin sheets from French Guiana shows that they represent a completely different species. The leaves are strongly verruculose above, and regularly minutely puberulous beneath, characters indicating a close affinity with S. *Erichsonii* Rich. Schomb. ex Prog. It is quite probable, therefore, that Bentham's name *smilacina* will be entirely relegated to synonymy in a future monograph of the genus.

A close ally of S. *Mitscherlichii* is S. *panurensis* Sprague et Sandwith which occurs on the Rio Uaupés, Brazil (*Spruce* 2634, type, Kew !) and at Esmeralda in Venezuela (*Tate* 310, New York !). The Spruce sheets, as has already been mentioned, were wrongly referred to S. *cogens* by both Bentham and Progel. The flowers of this species are still unknown, but it is clearly distinguishable from S. *Mitscherlichii* by its definitely lanceolate or ovate-lanceolate leaves which are more finely reticulate, and by its strongly pubescent inflorescence.

8. **S. Melinoniana** *Baill.* in Bull. Soc. Linn. Par. **1**, 256 (1880) ; Sandwith in Kew Bull. 1931, 487, et in Hook. Ic. Pl. 3174 (1932).

Leaves lanceolate to ovate, shining, usually more or less glaucescent beneath, coriaceous, quinquenerved or (sometimes conspicuously) quintuplinerved ; petiole glabrous, blackish, 5–11 mm. long. *Inflorescences* thyrsoid with congested cymes, densely minutely hirtellous. *Calyx* lobes roundish or broadly ovate, obtuse, ciliate, 1 mm. long, up to 1·5 mm. broad. *Corolla* tube 3–3·75 mm. long, up to 3 mm. broad, whitish-woolly within except at the glabrous base ; lobes 4–5 mm. long, densely whitish-woolly all over within. *Stamens* exserted, filaments 2–2·5 mm. long. *Ovary* whitish-pilose in the upper half ; style pilose near the base, otherwise glabrous. *Ripe* *fruit* not seen ; young fruit obovoid, about 11 mm. long and 8 mm. diameter.

BRITISH GUIANA. Moraballi Creek, Essequibo River, fl. Sept. 1929, *Sandwith* 342 (Kew !, distributed to many herbaria), fr. Oct. 1929, *Sandwith* 377 (Kew !). Issororo River, 1888, coll. *im Thurn* in *Jenman* 5198 (Kew ! New York !). Mairaka, Pomeroon River, fl. March 1932, *Davis* in *Forest Dept.* no. 2286 (Kew !). Arunamai Creek, Pomeroon River, March 1932, *Davis* in *Forest Dept.* no. 2279 (Kew !). Issororo Creek, Pomeroon River, Feb. 1932, *Davis* in *Forest Dept.* no. 2260 (Kew !). Mazaruni Station, fl. Aug. 1932, *Davis* in *Forest Dept.* no. 2303 (Kew !).

Distr. French Guiana.

9. **S. guianensis** (*Aubl.*) *Baill.* Bot. Médic. (Phanér.) 1219 (1884).—*Rouhamon guianensis* Aubl. Hist. Pl. Guiane, 93, t. 36 (1775). *Lasiostoma cirrhosa* Willd. Sp. Pl. **1**, 624 (1798). *L. divaricata* G. F. W. Mey. Fl. Esseq. 83 (1818). *Rouhamon divaricatum* DC. Prodr. **9**, 17 (1845). *Strychnos Rouhamon* Benth. in Journ. Linn. Soc. **1**, 106 (1857) ; Progel in Mart. Fl. Bras. **6**, pars. 1, 276, t. 76 (1868) ; van Raalte in Pulle, Fl. Surinam, **4**, 109 (1932).

Leaves elliptic, oblong or obovate, acute or shortly cuspidate at the apex, cuneate at the base, slightly shining or rather opaque, usually conspicuously quintuplinerved, stiffly chartaceous or thinly coriaceous ; petiole densely pubescent, 2–5 mm. long. *Inflorescences* pseudo-racemose, lax-flowered, densely pubescent. *Calyx* lobes lanceolate to ovate, more or less acute, ciliate, up to 1·5 mm. long and 0·75 mm. broad. *Corolla* tube 2 mm. long, whitish-woolly within except towards the glabrous base ; lobes up to 5·5 mm. long, densely whitish-woolly within in the lower half. *Stamens* exserted, filaments about 2 mm. long. *Ovary* and style glabrous. *Fruit* when ripe about 1·3 cm. diameter.

BRITISH GUIANA. Essequibo River (fide Progel), fl. Oct.-Nov., *Robert Schomburgk* 948 (Kew ! Brit. Mus. ! Cambridge ! Paris ! Berlin.). Lama Creek, Corentyne River, fl. and fr. Dec. 1887, *Jenman* 4303 (Kew !) ; fl. and fr. April 1889, *Jenman* 4651 (Kew ! Brit. Mus. ! New York !). Without locality, *Rudge* (Brit. Mus !).

Distr. Guiana, Amazonian Brazil and Venezuela.

It has not seemed desirable on present evidence to separate varieties or species based on the shape of the leaves or the calyx lobes, when the material agrees in other respects. Moreover, there seems to be no definite correlation between these two characters. It may be mentioned here that the calyx lobes of Schomburgk's collection are ovate, while those of Jenman's are longer and lanceolate, in this agreeing with *S. lanceolata* Spruce ex Benth. which should probably be reduced to *S. guianensis.* Further collecting and field observations of plants of this affinity would be welcome.

XLIX—BOTANICAL TERMS IN ISIDORUS.*

T. A. SPRAGUE.

The best known work of Isidorus of Seville (A.D. 560–636) is probably his " Etymologiarum libri XX," which is an etymological glossary of encyclopaedic extent, covering all branches of human knowledge. This work is very valuable to the philologist, since it affords evidence of the nature of the Latin language as used in Spain at the beginning of the Dark Ages : it contains various new words, and other words employed in new senses. To the botanist it is of some importance in the history of botanical terminology, lib. XVII being devoted to Agriculture and the Vegetable Kingdom, and lib. IV to Medicine and Pharmacy.

In Agriculture, the term *occatio* meant, not harrowing, as in classical times, but breaking up clods of earth with a mattock; and *cinis* (lit. ashes) denoted the clearing of land by means of burning. *Stipulae* was used for the leaf-sheaths of Grasses, as well as in the sense of stubble. *Stipa* was straw, not tow. *Arbustum*, while retaining its classical meaning of a plantation of trees, had come to be used also in the sense of sapling. *Vepres* was a spiny tree, not a thornbush. *Corymbus* was a coil of a tendril, and *cyma* was employed with the same meaning as *coma*, namely, for the leafy crown of a tree. The case of *hastula* is amusing. It has no real connection with the classical word *hastula* (dim. of *hasta*), a little spear, but is a corrupted form of *assula* (*astula*), a splinter. This may be seen by comparing Isidorus, " fomes est hastula, quae ab arboribus excutitur recisione," with Festus, " fomites sunt assulae ex arboribus, dum caeduntur, excussae." Similarly, the definition of *torris*, " torris lignum adustum, quem vulgus titionem appellat extractum foco, semiustum et extinctum " was taken by Isidorus from Lactantius, " titionem vulgus appellat extractum foco torrem semiustum et exstinctum."

We learn from Isidorus that inula (*Inula Helenium*) was known to the Spanish peasantry of his time by the name ala : " inula, quam alam rustici vocant, radice aromatica, odoris summi, levi acrimonia." The same name appears later under the forms alan, aland, and alant in German mediaeval and sixteenth century works, and the species is known at the present day as ala in Spain and as alant in Germany and Holland. Since *Inula Helenium* is indigenous in Spain, but is merely an introduced plant in Germany and Holland, it seems probable that the form " alam " was taken from Isidorus by mediaeval German herbalists, and was then gradually transformed into " alan " and " alant."

The fungi known as volvi, mentioned by Isidorus after tubera (truffles) were evidently puffballs, probably *Lycoperdon giganteum* (*L. Bovista*) : "volvi dicti, quod sint volubiles et rotundi." These were called pezicae by Pliny.

---

*See " Botanical terms in Pliny's Natural History " (*K.B.* 1933, 30).

The text of Isidorus consulted for the present paper is that adopted in Corpus Grammaticorum Latinorum veterum, ed. F. Lindemannus, Tomus III, Lipsiae, 1833. All the citations in the glossary are taken from Lib. XVII. Hence only the page, chapter and section numbers are given. Thus the reference to *corymbus* (527, v, 12) indicates p. 527, Lib. XVII, Cap. v, sect. 12.

GLOSSARY.

arbor, a tree, in general, whether barren or fruit-bearing (vide infra).

arbos, a fruit-bearing tree :—Arbor vero et fructifera et sterilis, arbos autem non nisi fructifera. Genere autem femenino arbores dicimus, poma vero neutro (530, vi, 3).

arbustum, (1) young tree or sapling, suitable for use as a stock in grafting; (2) plantation of trees, or wood :—Arbustum arbor novella et tenera, in qua insertio fieri potest, et dicta arbusta, quasi arboris hasta. Alii arbustum locum, in quo arbores sunt, volunt accipere, sicut salictum. Sic et virectum, ubi virgulae novellae et virentes (530, vi, 2) : Arborum nomen, sive herbarum ab arvis inflexum creditur, eo quod terris, fixis radicibus adhaereant. Utraque autem ideo sibi pene similia sunt, quia ex uno alterum gignitur. Nam dum sementem in terram ieciris, herba prius oritur, dehinc confota surgit in arborem, et infra parvum tempus, quam herbam videras, arbustum suspicis (529, vi, 1).

arista, awn :—Arista appellata, quod prius ipsa arescat (525, iii, 16).

aviarium, a remote grove :—Aviaria secreta nemora dicta, quod ea aves frequentant (530, vi, 9).

botrio [*botrys*], a bunch of grapes :—Racemus est botrionis pars, et botrio Graecum est (528, v, 14).

capreolus, tendril :—Capreoli dicti eo, quod capiant arbores, sunt enim cincinni, sive uncinuli, quibus se innectere vites et suspendere solent arboribus, quo adminiculo freti palmites ventos ac turbines sustinere queant, et sine lapsu periculorum fructus suos sustineant, ac sese vaga proceritate diffundant (527, v, 11).

caries, decay or rotting of wood :—Caries putredo lignorum, dictum hoc nomen, quod eveniat lignis virtute carentibus (532, vi, 28).

caulis, (1) main stem of a herb or vegetable; (2) cabbage :—Caulis est generaliter herbarum et olerum mediius frutex qui vulgo thyrsus dicitur, quod a terra sursum conscendat, a quo derivatum est, ut specialiter quoddam genus olerum caulis diceretur, quia thyrsus ipsius amplius caeteris oleribus coalescit, id est crescit. Est autem generale nomen. Omnis enim frutex caulis (556, x, 3).

cespites, low growth of stems, clump of plants :—Cespites frutices sunt, quasi cuspites, vel quasi circa pedes (530, vi, 13).

cinis, clearing land by burning before cultivation :—Cinis est incendium, per quod ager inutilem humorem exudat (523, ii, 2).

codex, stock of a grape vine :—Codex dictus, quasi caudex. Sic enim veteres et clodum pro claudo dicebant (527, v, 4).

cortex, bark :—Cortice veteres corucem vocabant. Dictus autem cortex, quod corio lignum tegat (530, vi, 15).

corymbus, coil of a tendril :—Corymbi sunt annuli qui proxima quaeque lignant et comprehendunt, ne longius laxati palmites ventorum flatibus dissipentur (527, v, 12).

culmus, culm, stalk of an ear of corn :—Culmus est ipse calamus spicae, qui a radicibus nascitur. Et dictus culmus, quasi calamus (525, iii, 16).

cyma, leafy crown of a tree, foliage :—Cymas vocatas quasi comas (531, vi, 20).

flagella, (1) flexible uppermost shoots of trees or shrubs :—Flagella dicuntur, ut praediximus, summae arborum partes, ab eo quod crebros ventorum sustinent flatus (531, vi, 19) : Summitates vitium et fruticum flagella nuncupantur, eo quod flatu agitentur (527, v, 8) ; (2) slender whip-like shoots of a herb :—Colocynthis cucurbita agrestis et vehementer amara, quae similiter ut cucurbita per terram flagella tendit (548, ix, 32).

flos, flower, coloured perianth :—Flores nominati, quod cito defluant de arboribus, quasi fluores, quod cito solvantur. In his duplex gratia, coloris et odoris. Austro enim flores solvuntur, Zephyro fiunt (531, vi, 21).

fodere, to dig :—Fodere vero foveam facere, quasi fovere (529, v, 33).

folliculus, glumes of an ear of corn, taken as a whole :—Folliculus est theca frumenti, in qua granum servator interius. Haec super spicam vallo instructo munimen praetendit, ne avium minorum morsibus spica suis fructibus exuatur, aut vestigiis proteratur (525, iii, 17).

fomes, tinder, touchwood (531, vi, 26).

frons, leafy bough, green branch :—Frondes, quod ferant virgulta, vel umbras, sunt enim causa umbrarum (530, vi, 13).

fructus, produce, fruit :—Fructus nomen accepit a frumine, id est eminente gutturis parte, qua vescimur, unde et fruges. Fructus autem proprie dicuntur agrorum et arborum quibus utique utimur. In animalibus vero abusive et translative vocari fructum (531, vi, 23).

fruges (lit. fruits of the earth) unbearded cereals (vide *frumentum*).

frumentum, corn, cereal grass, especially the bearded kinds :—Frumenta sunt proprie, quae aristas habent, fruges autem reliqua (524, iii, 2).

fruteta (pl. of *frutetum*), a tall tree (vide infra).

frutex, a shrub, bush, branched plant, frondose plant :—Frutex brevis est appellatus, qui terram fronde tegat, cuius plurale nomen fruteta arbor alta est (530, vi, 4).

germen, a swelling bud or sprout :—Germen dicimus surculum praegnantem, a gerendo, unde et germinatio (531, vi, 22).

germinatio, sprouting, coming into leaf (vide supra.)

hastula [*astula, assula*], splinter :—Hastula a tollendo nuncupata, fomes est hastula, quae ab arboribus excutititur, recisione aut hastulae ambustae, aut ligna cavata nuncupata a fungis, quod ita capiat ignem. De quo Virgilius: Rapuitque in fomite flammam (531, vi, 26).

incensio stipularum, burning the stubble (523, ii, 1).

insitio, grafting :—Insitio dicitur, cum inciso trunco surculus foecundae arboris sterili inseritur, aut oculorum impositio, cum, inciso cortice, libro alienae arboris germen immittitur (530, vi, 11).

intermissio, lying fallow (523, ii, 2).

legumen, pulse, leguminous plant with edible seeds :—Legumina a legendo dicta, quasi electa. Veteres enim meliora quaeque legebant, sive quod manu legantur, nec lectionem requirant (525, iv, 1). Leguminum plura genera, ex quibus faba, lenticula, pisum, faselum, cicer, lupinum gratiora in hominum usum habentur (526, iv, 2).

liber, bast, inner part of bark :—Liber est corticis pars interior, dictus a liberato cortice, id est ablato. Est autem medium quoddam inter lignum et corticem (531, vi, 16).

lignum, wood, especially firewood :—Ligna dicta, quia accensa convertuntur in lumen. Unde ellychnium dicitur, quod lumen det (531, vi, 25).

lucus, a dark, dense wood or grove :—Lucus est densitas arborum solo lucem detrahens, tropo antiphrasi, eo quod non luceat, sive a luce, quod in eo lucebant funalia, vel cerei propter nemorum umbras (530, vi, 7).

malleolus, mallet-shoot :—Malleolus est novellus palmes innatus prioris anni flagello, cognominatusque ob similitudinem rei, quod in ea parte, qua deciditur, ex veteri sarmento prominens utrimque mallei speciem praebet (527, v, 5).

malum, a large, fleshy fruit, e.g. of *Pyrus*, *Cydonia*, *Amygdalus persica*, *Punica* :—Poma omnia mollia mala dicta sunt, sed cum adiectione terrarum, in quibus antea nata sunt, ut Persica, Punica, Matana, Cydonia, etc. (535, vii, 22).

messis, reaping, harvesting :—Messis a metendo, id est a recidendo dicta (524, ii, 6).

nemus, a shady grove of tall trees :—Nemus a numinibus nuncupatum, quia pagani ibi idola consecrabant. Sunt enim nemora arbores maiores, umbrosae frondibus (530, vi, 6).

nucleus=*nux* (2).

nux, (1) the walnut tree :—Hanc alio nomine Latini iuglandem vocant, quasi Iovis glandem (535, vii, 21); (2) edible kernel with a hard rind, nut, e.g. of *Pinus*, *Juglans*, *Corylus*, *Quercus*, *Castanea*, *Amygdalus communis* :—Nuces autem generaliter dicuntur omnia poma corio duriori tecta, ut pineae, nuces, avellanae, glandes, castaneae, amygdalae. Hinc et nuclei dicti, quod sint duro corio tecti (535, vii, 22).

oblaqueare, to trench round the roots of a tree or shrub :—Oblaqueare est circa codicem terram aperire et velut locum efficere. Hoc aliqui excodicare appellant (529, v, 31).

oblaqueatio, trenching round the base of a tree or shrub :—Vitibus inter caetera genera magis ista conveniunt, oblaqueatio putatio, propaginatio, fossio (529, v, 30).

occatio, breaking large clods of earth with a mattock :—Occatio est, cum rustici satione facta bobus dimissis grandes glebas caedunt ac ligonibus frangunt, et dicta occatio quasi obcaecatio, quod operiat semina. Occare igitur est operire terra semina, vites, vel arbores (523, ii, 4).

oculus, a vegetative bud :—Oculi nodi sunt, ex quibus frondes exeunt (530, vi, 13).

olus, vegetable :—Olus ab alendo dictum, eo quod primum homines ab oleribus alerentur, antequam fruges et carnes ederent. Tantum enim pomis arborum, vel oleribus alebantur, sicut animalia herbis (556, x, 2).

palea, chaff :—Palea a quibusdam vocari dicitur, quod pala ventiletur, ut frumentum purgentur (525, iii, 19).

palmes, young, soft-wooded, fruit-bearing shoots of the vine :—Palmes vitis materia mollis, qui per novella brachia emissus fructum affert. Nam ideo rustici partem vitis palmitem dicunt (527, v, 9).

pampinus, foliage of the vine :—Pampinus est folia, cuius subsidio vitis a frigore, vel ardore defenditur, atque adversus omnem iniuriam munitur. Qui ideo alicubi intercisus est, ut et solem ad maturitatem fructus admittat, et umbram faciat. Et dictus pampinus, quod de palmite pendeat (527, v, 10).

plantae, *plantaria*, transplanted seedling trees, nursery seedlings :—Plantae sunt de arboribus, plantaria vero, quae ex seminibus nata sunt cum radicibus, et a terra propria transferuntur (530, vi, 12).

pomum, edible fruit of any kind :—Poma dicta ab opimo, id est a copiae ubertate. Matura dicuntur, quia apta sunt ad manducandum sic et immatura, quia priusquam fiant matura, dura sunt ad manducandum (531, vi, 24).

propaginare, to propagate by layering :—Propaginare vero est flagellum vitis terrae submersum sternere, et quasi porro pangere. Hinc propagines a propagare, id est protendere dictae (529, v, 33).

propago, a layer (vide supra).

proscissio, the first ploughing of land :—Proscissio est aratio prima, cum adhuc ager durus est (523, ii, 5).

putare, to prune :—Putare est virgam ex vite superfluam resecare, cuius flagellis luxuriat. Putare enim dicitur purgare, id est amputare (529, v, 32).

quisquiliae, vegetable refuse, droppings of trees :—Quisquiliae sunt stipulae immixtae surculis foliis ac aridis. Sunt autem purgamenta terrarum (532, vi, 28).

racemus, part of a bunch of grapes :—Racemus est botrionis pars, et botrio Graecum est (528, v. 14).

radix, root, underground stem :—Radix appellatur, quod quasi radiis quibusdam fixa terris, in profundo dimergitur. Nam physici dicunt parem esse altitudinem radicum et arborum. Alii radicem a similitudine radiorum dictam putant, vel quia, si eradatur, non repullulat (530, vi, 14).

ramus, bough or main branch of a tree :—Rami sunt, qui de trunco manunt, sicut a ramusculis caetera (531, vi, 17).

ramusculus, subordinate branch (vide supra).

recidiva, trees regenerating after cutting down, second growth wood :—Recidiva arborum sunt, quae aliis sectis repullulant. Alii recidiva a cadendo dicunt, quia post casum nascuntur. Alii a recidendo et repullulando dixerunt. Ergo recidivum, ubi mors est casus (530, vi, 10).

runcatio, weeding :—Runcatio est a terra herbas evellere (523, ii, 4).

sagitta, the slender youngest part of a lateral vine shoot :—Sagittam rustici vocant novissimam partem surculi, sive quia longius recessit a matre, et quasi prosiliit, seu quia acuminis tenuitate speciem praefert teli (527, v, 7).

saltus, a dense wood of tall trees :—Saltus est densitas arborum alta, vocata hoc nomine, eo quod exiliat in altum, et in sublime consurgat (530, vi, 8).

sarmentum, slender branch :—Sarmentum a serendo (527, v, 5).

satio, sowing :—Satio dicta, quasi seminis actio, vel quasi satorum actio (524, ii, 6).

seges, a cornfield :—Seges autem de semine dicta, quod iacimus, sive a sectione (524, ii, 7).

sentix, brier :—Sentix dicta a situ, quod est terra unculta, in qua sentices spinaeque nascuntur. Maiores autem nostri omnem arborem spinosam dicebant veprem, quod vi prendat (540, vii, 60).

silva, a dense wood of small extent :—Silva vero spissum nemus et breve. Silva dicta quasi xilva, quod ibi ligna caedantur. Nam Graeci ξύλον lignum dicunt. Multa enim nomina Graecam plerumque etymologiam recipiunt (530, vi, 5).

spado, sterile shoot :—Spadones sunt surculi fruge carentes, ex ipsa appellatione, quod sint inhabiles fructu et sterilitate affecti (527, v, 6).

spica, young bristly ear of corn :—Spicam de maturis frugibus abusive dicimus. Nam proprie spica est, cum per culmi folliculum, id est extremum tumorem aristae adhuc tenues in modum spiculi eminent (525, iii, 15).

stipa, straw :—Stipa vocata, propter quod ex ea stipentur tecta. Hinc et stipula per diminutionem (539, vii, 56).

stipula, (1) vagina of a grass leaf :—Stipulae sunt folia seu vaginae, quibus culmus ambitur atque fulcitur, ne pondere frugis curvitur, qua ambiunt culmum. Et dicta stipula quasi usta, et quasi ustipula. Stipula dicta ab usto, collecta enim messe uritur propter culturam agri. Item stipula, vel quia pars eius uritur, pars interdum pro palea praeciditur (525, iii, 18); (2) *stipulae* (pl.), stubble :—Incensio stipularum (523, ii, 1).

sulcus, furrow :—Sulcus a sole vocatur, quod proscissus solem capiat (523, ii, 5).

surculus, branchlet, twig :—Surculi sunt a praecisione serrae nuncupati (531, vi, 17).

thyrsus, erect main stem (vide *caulis*).

torris, brand, firebrand :—Torris lignum adustum, quem vulgus titionem appellat extractum foco, semiustum et extinctum (531, vi, 27).

traducere, *transducere*, to transplant (529, v, 33).

truncus, trunk of a tree :—Truncus est statura arboris insistens radici (530, vi, 15).

turbiscus, a group of many shoots from a single clump or stump :—Turbiscus, quod de uno cespite eius multa virgulta surgunt, quasi turba (539, vii, 56).

uva, a relatively small, fleshy, juicy fruit :—Uvae dictae quod intrinsecus humore sunt plenae, succoque et pinguedine. Nam humidum, quod exterius humorem habet, uvidum quod interius (527, v, 13).

uvidum, juicy (vide supra).

vepres, a spiny tree (vide *sentix*).

vervactum, fallow ground :—Vervactum dictum quasi vere actum, id est verno aratum (532, ii, 5).

virga, slender branch, twig (vide infra).

virgultum, stool shoot, shoot from the base or root of a tree :—Virgultum est, quod de radice pullulat, ramus, qui de ipso robore arboris, virga, quae de ramis. Proprie autem virgultum appellatur, quod ad radicem arboris nascitur, et quasi inutile ab agricolis amputatur. Et hinc dictum virgultum, quia ex virga tollitur (531, vi, 18).

vitis, grape vine :—Vitis dicta, quod vim habeat citius radicandi. Alii putant vites dictas, quia se invicem vittis innectant, vicinisque arboribus reptando religentur. Est enim earum natura flexibilis, quae quasi brachiis quibusdam quicquid comprehenderint, stringunt (526, v, 2).—Apparently not used by Isidorus in the general sense of climbing plant.

L—TWO PLANTS NEW TO THE FLORA OF CYPRUS.

A. K. JACKSON.

Catapodium loliaceum (*Huds.*) *Link*, Hort. Berol. **1**, 45 (1827). *Poa loliacea* Huds. Fl. Angl. **1**, 35 (1762).

Specimens of this species have been received in a collection of plants made by Mr. A. Syngrassides in the Kyrenia district of Cyprus. The following are the details on the label: Kyrenia, about 200 yards away from the sea-shore, growing in a rich loam covering the rocks in a thin layer, 27.4.32, *Syngrassides* 3.

Though not recorded in Holmboe, Studies on the Vegetation of Cyprus (1914), there are specimens of this species at Kew collected on Cap St. André, 25.4.1880, *Sintenis et Rigo* 390. The species has a wide distribution through the countries bordering the Mediterranean and the Atlantic coast of Europe.

Minuartia geniculata (*Poir.*) *Thell.* Fl. adv. Montp. 232 (1912); *Arenaria geniculata* Poir. Fl. Barb. **2,** 106 (1789); *Rhodalsine geniculata* Williams in Bull. Herb. Boiss. **6,** 7 (1898).

Specimens collected at Kyrenia, about 10 yards from the seashore on dry sand, 27.4.1932, *Syngrassides* 12, have been identified as this species. They agree with Poiret's original description, except that the petals are (in the dried state) pink. In this respect they agree with Vahl's description of his *Arenaria procumbens* (Symb. Bot. **2,** 50 : 1791). After an examination of the whole of the material of *Minuartia* sect. *Psammophilae* Fenzl (see Mattfeld in Fedde Repert. Beih. **15,** 215 : 1922) it has been concluded that *M. procumbens* (Vahl) Graebn. and *M. geniculata* (Poir.) Thell. are not specifically distinct. This species (in the broad sense) occurs in Spain, Sicily, Sardinia, Italy (local), Malta, Greece (local), Egypt, Morocco, Algeria, and Tunis.

LI—MISCELLANEOUS NOTES.

RETIREMENT OF MR. WINN.—Mr. Williams Nicholls Winn, M.B.E., retired from the post of Botanist (previously Assistant) in the Curator's Office on June 15th, 1933, having reached the age-limit after over 43 years' service at Kew.

After receiving early horticultural training in Cornwall, Mr. Winn entered Kew as a Student Gardener on March 24th, 1890, and was promoted to be Sub-foreman on July 7th, 1891. The following year, on October 1st, he was appointed Assistant in the Curator's Office, a post which he held until his retirement this year.

Through his unflagging zeal for hard work, great attention to detail, and intimate knowledge of the work of the office, Mr. Winn has been an invaluable right-hand man to a succession of five Curators. Writing on October 24th, 1906, Mr. W. Watson, Curator from 1901–1922, said "I would like to record my sense of the thorough painstaking performance of the duties of Assistant in the Curator's Office by Mr. W. N. Winn. He is a most excellent officer and as a proof of his promptness and willingness I may mention his having worked over fifty hours overtime since October 1 in the preparation of the estimates, etc." a verdict which has been heartily endorsed by Mr. Watson's successors. In the Birthday Honours List for 1933, Mr. Winn received the M.B.E. in recognition of his long and meritorious services at Kew.

Mr. Winn has always taken a keen interest in the sport of the Gardens. He was captain of the cricket team in his Student Gardener days, and for many years has been the Secretary and moving spirit of the tennis club, a post which it is hoped he will continue to fill during many years of active and happy retirement.

MR. REGINALD FRANCIS WILLIAMS has been appointed Higher Grade Clerk in the Curator's Office in succession to Mr. Winn.

WILLIAM GRANT CRAIB.—Systematic Botany has sustained a serious loss in the death of William Grant Craib, F.L.S., F.R.S.E., Regius Professor of Botany in the University of Aberdeen, at the early age of 51. Accompanied by his wife, Professor Craib was spending part of his long vacation at Kew, when he became unwell and died there, after a brief illness, on September 1st.

Craib was a son of the late Mr. William Craib, a farmer of Kirkside, Banff, and was born on March 10th, 1882. He received his early education at the Banff and Fordyce Academies. Later he entered Aberdeen University where, in 1907, he graduated in arts, with special distinction in botany. During his undergraduate days he made a considerable collection of wild plants around Banff, for which he received the Dickie Prize of the University. This, no doubt, turned his thoughts to the serious study of flowering plants.

While working in 1908 for his B.Sc. degree, he was recommended by the late Professor Trail to apply for a temporary post as Acting Curator of the Herbarium at the Royal Botanic Gardens, Calcutta, which Major (now Colonel) Gage was then seeking to fill. Craib applied and was appointed. When acting at Calcutta under Mr. (now Sir William) Wright-Smith, during Major Gage's absence on leave, he made large collections in the North Cachar Hills, which he subsequently named. In the spring of 1909 the post of Assistant for India at Kew fell vacant, and it was offered to Craib by the Secretary of State, on the recommendation of Sir David Prain. During his tenure of this post he made valuable contributions to the botany of India and S. W. China. He was at that time particularly interested in the family *Leguminosae* and in the genus *Primula*, on both of which he published papers, and later he worked on the *Gesneraceae*. It was while at Kew that he commenced his studies on the flora of Siam, which became his chief work in life, and to which he gave up most of his leisure. In 1909 collections began to come to Kew from Siam, and these were handed to Craib to deal with. The following year Dr. C. C. Hosseus, who had visited Siam in 1904–1905 to collect plants, came to Kew to work out some of his critical species. Craib saw his collections, and this still further increased his interest in a region with a rich flora, at that time but imperfectly known. The stimulus of Craib's letters to the collectors in the field was largely responsible for the continuance of the collecting.

In 1909 Craib began to publish the results of his Siamese work. In the "Kew Bulletin" of that, and the following year, there appeared the descriptions of several new species from Siam, some of which were done in conjunction with Mr. J. Hutchinson. In 1911 he began the publication of his "Contributions to the Flora of Siam" in the

Bulletin with the sub-heading "List of Siamese Plants with Descriptions of new Species." This list was finished in 1912 when the Monocotyledons, excluding *Orchidaceae*, were published. The primary idea of the List was to give additions to Dr. F. N. Williams's "Liste des Plantes connues du Siam," published in the "Bulletin of the Herbarium Boissier" (1904–5). Craib's list did not extend to the Siamese part of the Malay Peninsula, and chiefly accounted for the new records of Dr. C. C. Hosseus, and the collections made in Northern Siam by Dr. A. F. G. Kerr. In the "Kew Bulletin" for 1912, Craib published the first of a long series of "Additamenta" to his "Contributions to the Flora of Siam." These contained descriptions of new species, the last one being published early this year. From 1912 onwards seldom a year passed without the appearance of at least one "Additamentum." In all, thirty-three appeared. Four of these were by other authors, chiefly students trained by Craib himself, the remainder being mainly his own work. In these twenty-nine "Additamenta" upwards of 700 new species were described. Here also appeared the descriptions of the new genera *Pittosporopsis* (*Icacinaceae*), *Muronia*, and *Afgekia* (*Leguminosae*).

In the year 1915 Craib accepted the post of Lecturer in Forest Botany and Indian Trees at Edinburgh University, offered to him by Professor Sir Isaac Bayley Balfour. It was at this time that he began spending his vacations at Kew in pursuance of his Siamese studies. Soon, however, he became immersed in work for the Air Board, which he took up with characteristic energy, working 12–14 hours daily, Saturdays and Sundays included. In 1918 Craib commenced his investigations on the distribution of sap in trees. This proved very exacting work, sometimes entailing his remaining in the laboratory all night. Most of the previous work on sap had been done on leaf-bearing twigs. Craib tackled the trunks of full-grown trees, and obtained some very interesting results which were published in a series of three papers, under the title "Regional Spread of Moisture in the Wood of Trees" in "Notes from the Royal Botanic Gardens, Edinburgh" (1918–1923).

While in Edinburgh, in 1917, Craib married Mary Beatrice, younger daughter of the late Mr. James Turner of Acton. This proved a very happy marriage. Mrs. Craib entered whole-heartedly into his work and was able to assist him in many ways.

In 1920 Craib was appointed to the Regius Professorship of Botany in Aberdeen University. At about the same time he was also offered a post as Botanist to the Royal Siamese Forest Department. Fortunately, at least from the point of view of his work on the Siamese flora, he decided against going out to Siam.

At Aberdeen Craib devoted himself largely to Systematic Botany, and fostered special research in the subject among his students, several of whom have made important contributions to the flora of Siam.

In 1921 Craib had the misfortune to lose a leg through a railway accident during the meeting of the British Association at Edinburgh, which proved a great handicap, and entailed a more sedentary life than was good for his health. However, he continued with unabated vigour his studies on Siamese plants, coming to Kew nearly every long vacation to work on the more critical species.

Craib took a very lively interest in the Cruikshank Botanic Gardens, the collections were largely increased and with the help of Mr. William Grant, he was successful in growing plants from Siam. When the Royal Horticultural Society of Aberdeen celebrated its centenary in August 1924, the Cruikshank Botanic Gardens exhibit of Siamese plants was awarded a Lindley Medal.

In 1925 Craib commenced the publication of what must be considered his principal work, his " Flora Siamensis Enumeratio." This was issued under the auspices of the Siam Society, who published the work in Bangkok. In Craib's own words the Enumeratio " was to bring together into one list the scattered records of previous papers, supplemented by more recent work. Such a list, it was felt, would be of some service to residents in Siam who are interested in the subject, both as a record of the present state of our knowledge of the Flora, and as affording a readier means of recording additions. It has been compiled from that point of view, and also to some extent to form a more suitable basis for the work of flora-writers in the future." These words, however, give no idea of the vast amount of original work contributed to it by Craib himself. At the time of his death the first volume of this enumeration, containing all the *Polypetalae*, had been issued, as well as the first part of Volume 2. The manuscript of the second part of Volume 2, finishing the *Rubiaceae*, had also been sent to the press, and the proofs of the greater part of it corrected.

Craib's name is commemorated in the genera *Craibiodendron* and *Craibia*, and in a number of specific names.

Siam is indeed much indebted to Craib, and will realise this more and more in the years to come. He spared neither energy, health, nor money in his devotedness to his favourite study.

As a Professor, Craib was a stimulating teacher, and had the faculty of inspiring his students with some of his enthusiasm. Fortunately he has left several who are anxious to carry on his work. Craib was a worthy successor to Trail, and it is to be hoped that Aberdeen will keep up the high tradition of Systematic Botany set by these two fine teachers.

Bibliography of Principal Works.

Contributions to the Flora of Siam :

- List of Siamese Plants with Descriptions of New Species. *Kew Bull.* 1911–1912.
- Additamenta i–xv, xvii–xx & xxiii–xxviii. *Kew Bull.* 1912–1933.

Flora of Banffshire. *Aberdeen University Studies*, no. 54 (1912).

Contributions to the Flora of Siam, Dicotyledones. *Aberdeen University Studies*, no. 57 (1912) (this is a reprint, with additions, of the papers in *Kew Bull.* 1911).

Various notes on new species in *Hook. Icon. Pl.* 1913–1922 (tt. 2932, 2935, 2977, 2979, 2999, 3003, 3005).
Plantae Meeboldianae novae. *Fed. Rep.* **12** (1913).
The Indigoferas of China. *Notes R. B. G. Edin.* **36** (1912).
Chinese Leguminosae (except a few genera). *Sargent, Plantae Wilsonianae,* **2** (1914),
Notes on Himalayan Primulas. *Journ. R.H.S.* 1914.
New Species of Primula belonging to the *Petiolaris-Sonchifolia* Section. *Notes R.B.G. Edin.* **29–30** (1917).
Primulae Novitates Nonnullae. *Notes R.B.G. Edin.* **49–50**, 1918.
Gesneracearum Novitates Nonnullae. *Notes R.B.G. Edin.* **49–50** (1918).
Regional Spread of Moisture in the Wood of Trees :
  i. *Notes R.B.G. Edin.* **51** (1918).
  ii. *Notes R.B.G. Edin.* **54** (1920).
  iii. *Notes R.B.G. Edin.* **66** (1923).
A New Chinese Pseudotuga. *Notes R.B.G. Edin.* **60** (1919).
Abies Delavayi in Cultivation. *Notes R.B.G. Edin.* **60** (1919).
Gesneracearum Novitates. *Notes R.B.G. Edin.* **60** (1919).
Didissandra and Allied Genera in China and N. India. *Notes R.B.G. Edin.* **60** (1919).
Revision of Petrocosmea. *Notes R.B.G. Edin.* **60** (1919).
Some New Species from Siam. *Gard. Chron.* Ser. 3, **72** (1922).
Six New Flowering Plants from Siam. *Journ. Nat. Hist. Soc. Siam,* **6** (1923).
Flora Siamensis Enumeratio (1925–32).
Some New Siamese Begonias. *Gard. Chron.* Ser. 3, **83** (1928).
Some New Siamese Plants. *Gard. Chron.* Ser. 3. **83** (1928).

A. F. G. K.

Henry George Greenish.—The death of Professor Greenish on August 2nd at the age of 78 came with tragic suddenness shortly after his retirement from the Pharmacy School, where he had served the Pharmaceutical Society of Great Britain for nearly half a century. His distinguished career with the Society included appointments first (in 1890) as a Lecturer in Materia Medica, then successively as Professor of Pharmaceutics, Director of the Pharmacy Research Laboratory and Dean of the School. Prof. Greenish was in touch with Kew for practically the whole of this period. As Secretary of the Committee of the Pharmaceutical Society for the 1898 edition of the British Pharmacopoeia he was associated with the late Sir William Thiselton-Dyer, who acted as referee in Botany, and with Sir David Prain as joint-editor (with the late Prof. Sir Nestor Tirard) of the Pharmacopoeia in 1914 ; recently as a member of the Commission for the production of the 1932 edition he was in communication with the present Director on matters relating to Botany.

His published works are numerous, the more important being " A Text Book of Materia Medica " for students of pharmacy and medicine—the sixth edition (1933) being issued shortly before his death; "The Microscopical examination of Food and Drugs"—third edition 1923; "An Anatomical Atlas of Vegetable Powders" (1904), in collaboration with Eugene Collin; and many important memoirs and papers in "The Pharmaceutical Journal" and "The Chemist and Druggist" on drugs, giving results of original research, one of the most recent being on "New Sources of Santonin" (*Artemisia Cina* Berg).

As author, teacher and research worker, Prof. Greenish achieved an international reputation. He received the Hanbury Gold Medal in 1917, was selected by the Board of Professors of the School of Pharmacy of Paris with four other men of science for the conferment of the honorary degree of Doctor of Science of the University of Paris (1917), and served as President of the Pharmaceutical Conference of Great Britain for 1921–1922.

ERIC DRABBLE.—We learn with regret of the death of Dr. Eric Drabble, F.L.S., A.R.C.Sc., which took place at Freshwater, Isle of Wight, on August 3rd.

Dr. Drabble was born in 1877 and was educated at Chesterfield Grammar School. He secured the London B.Sc. degree while a student at the Royal College of Science and his D.Sc. in 1903. In 1908 he succeeded the late Dr. Percy Groom as head of the Botanical Department of the Northern Polytechnic, London. During the late war he took charge of the botanical department at Birkbeck College and combined the botanical work of the two establishments. In 1924 he was obliged through ill-health to retire from active teaching and he moved to the Isle of Wight.

Dr. Drabble was always keenly interested in British plants and particularly in the British pansies on which he was the accepted authority. He published many papers on British plants and was the author of an elementary text-book of botany.

Those who were closely associated with him will remember him as a brilliant lecturer and a sympathetic teacher. F. B.

Coroa Coffee.—An enquiry was recently received at Kew for seeds of a remarkable new coffee called "Coroa" (or Crown), reported to have been raised in the State of Espirito Santo, Brazil, and to produce berries containing twelve seeds. Enquiry at the source of production, through the kind offices of Mr. J. G. Lomax, H.M. Commercial Secretary at Rio de Janeiro, elicited the fact that the new tree was not well known to planters there. Specimens obtained by Mr. Lomax from Espirito Santo and forwarded to Kew, proved to be a fasciated form of Arabian Coffee (*Coffea arabica*) which, however, is not likely to be of any economic or commercial value. The fasciation occurs in the shoots, flowers and fruits, and produces multiplication of the reproductive parts. The usual five stamens are increased to eleven and numerous ovules are produced, giving rise to a corresponding increase of seeds, which in the normal form number two in a berry. It is suggested that the malformation is due to especially luxuriant growth. Mr. W. C. Worsdell informs me that he has not met with a similar case in coffee during his work on plant teratology. Dr. O. Penzig in Pflanzen-Teratologie, **2**, 448 (1921) states that in *Coffea arabica* and *C. liberica* synanthy and syncarpy are common at Buitenzorg, and that in the latter species polymerous flowers are very frequent. J. H. H.

Abies pindrow *Royle.*—The correct name of the West Himalayan Fir is *Abies pindrow* Royle, not *A. Pindrow* Spach, as cited in almost all works of reference. In the first place, the specific epithet " pindrow " should be spelt with a small initial letter, since it is neither a personal nor a generic name, but is merely a vernacular name of the tree (International Rules, ed. 2, Rec. X). Secondly, there is no good reason for citing Spach as the author of *Abies pindrow.* Spach himself (Hist. Nat. Veg., Phan. **11,** 423) correctly cited *Abies pindrow* from Royle, Ill. t. 86. The origin of the mistaken attribution of the name to Spach is the fact that the text corresponding to Royle's plate included (1) the remarks of Royle (pp. 350, 351), who placed the species under *Abies,* and (2) the diagnosis supplied by D. Don (p. 354), who placed it alternatively under *Pinus* L. (sensu lato) or *Picea* D. Don. It may be mentioned that Don used the generic name *Picea* for what is now called *Abies,* and *Abies* for what is now known as *Picea,* as in Loudon's Arboretum et Fruticetum Britannicum, **4,** 2293, 2329 (1838), where we find *Abies* D. Don, the Spruce Fir, and *Picea* D. Don, the Silver Fir. Royle very properly included Don's diagnosis of the species under the names adopted by Don, but he himself preferred to employ the name *Abies* for the genus which included the Silver Fir, following Link (1827), Ledebour (1833), and Nees von Esenbeck (1835).

In a paper (see p. 378) on the dates of publication of Royle's " Illustrations " it is shown that many of the plates appeared in earlier parts of the work than the corresponding text. According to Loudon's Gardener's Magazine, **12,** 319 (June 1836) the plate of *Abies pindrow* appeared in Part IX [May 1836]. Pp. 350–354, on the other hand, appeared in Part X [Febr. 1839]. The dates of publication of the respective parts, and the pages of text contained in them, are given on p. lxxx (unnumbered) of the Introduction to Royle's " Illustrations." The figure of *Abies pindrow* Royle (t. 86) is accompanied by analyses, and the name was therefore validly published in 1836 (Internat. Rules, ed. 2, Art 37). *Pinus pindrow* (1837) and *Picea pindrow* (1838) were new combinations published respectively in Lambert's " Pinetum " and Loudon's " Arboretum." Both should be attributed to D. Don. The principal synonymy of *Abies pindrow* follows.

Abies pindrow *Royle,* Ill. t. 86, fig. a-c (May 1836) ; et pp. 350, 351 (Febr. 1839).

Pinus pindrow D. Don in Lambert, Pinetum, ed. 1837–42, **3,** 47–48, t. 99 (1837).

Picea pindrow [D. Don ex] Loud. Arb. et Frut. Brit. **4**, 2346 (1838); et in Royle, Ill. 354 (Febr. 1839).

Abies Webbiana var. *pindrow* Brandis, For. Fl. Brit. Ind. 528 (1874).

T. A. S.

The Flora of Surinam.*—More than twenty-five years have passed since Dr. Pulle published his " Enumeration of the vascular plants known from Surinam," with localities for the species, distribution, vernacular names and occasional synonyms, adding a useful history of the investigation of the flora of the Colony and some valuable phytogeographical remarks. Since then great quantities of material from the Colony, particularly of the larger forest trees, have accumulated in the Utrecht Herbarium, and Dr. Pulle is now editing a Flora of Surinam (in English) on a complete scale, which promises to be the most important and useful work published on South American botany since Martius' Flora Brasiliensis. We venture, indeed, to express the opinion that the ideal of a colonial flora will here be achieved, since the work is unashamedly planned and calculated to please taxonomists and specialists throughout the herbaria of the world, as well as to serve the requirements of forest officers and agricultural workers in the field. Thus the treatment of each family comprises careful generic and specific keys, long generic and specific descriptions, generous synonymy, distribution of the species and their localities in Surinam (with citation of specimens), and vernacular names. The work is excellently printed and the whole format is attractive and scholarly.

Following these lines and in the pursuit of this aim, the editor has most wisely seen that the first essential is not to hurry, and that the second is to enlist the services of as many collaborators as possible, including numerous well-known specialists. The Flora, which will only contain the Phanerogams, is to be published in four volumes, the whole work containing about 1500 pages, and families in each volume are to appear as soon as they are ready for the press. Those families which have appeared up to date include the *Malvaceae* by Dr. H. Uittien, the *Convolvulaceae* by Dr. S. J. van Ooststroom, and an invaluable account of the *Euphorbiaceae* by Dr. J. Lanjouw. Another important contribution is the treatment of the difficult family *Apocynaceae* by Dr. Fr. Markgraf of Berlin. All these contributions give evidence of the same care and critical approach to the work which will make every student welcome the appearance of this Flora, and which will naturally give peculiar satisfaction to workers on the adjacent flora of British Guiana. In this connexion we may note, with Dr. P. J. Eyma, that " the present state of our knowledge of the flora of Surinam, at least of the families treated here, does not permit the drawing of any plant-geographical conclusion based on a comparison of Surinam with French and British Guiana." Coincidence plays too large a part in the collection of species, particularly of climbers, in tropical forests. For instance, 9 species of *Strychnos* are known in British Guiana, but only 1 is recorded from Surinam ; and 2 species of *Forsteronia* have so far been collected in Surinam, whereas no less than 4 were felled by the Oxford University Expedition to British Guiana within a radius of two miles from camp. Far more perplexing is the question of the distribution of forest trees, which are in certain cases, e.g., Greenheart, far more local than is generally believed. It is rather curious that certain small trees of the bottom storey, which are abundant in the coastal region of British Guiana, are at present unknown in Surinam, and even more remarkable is the fact that *Catostemma fragrans*, a large tree which is rendered conspicuous by the external rings on the bark, and is well known in both British Guiana and in Cayenne (under the name *Guenetia macrosperma* Sagot ex Benoist), has never yet been noticed in the Dutch forest reserves. For *Strychnos Rouhamon* Benth. we should prefer the combination *S. guianensis* (Aubl.) Baill., based on *Rouhamon guianensis* Aubl. ; and some mention should have been made of *Sloanea amplifrons* I. M. Johnston, a name applied by its author to the Guiana tree which has for so long been known as *S. dentata* L., Linnaeus' name being restricted by him to a West Indian plant (see Contr. Gray Herb. **75,** 29–30, 1925). It is to be hoped that uniformity will be secured in the spelling of the South American Republic as Colombia, in preference to Columbia.

---

*The Flora of Surinam (Dutch Guyana), edited by Dr. A. Pulle, Prof. of Systematic Botany at the University of Utrecht, Netherlands. Vol. I, Gnetaceae to Ulmaceae (pp. 1–48); vol. II, Euphorbiaceae to Rhamnaceae and Monimiaceae (pp. 1–112); vol. III, Malvaceae to Elaeocarpaceae (pp. 1–64); vol. IV, Apocynaceae to Pedaliaceae (pp. 1–112). Edited by the Koloniaal Instituut te Amsterdam, printed by J. H. de Bussy, Ltd., Amsterdam, 1932.

N. Y. S.

Printed under the authority of HIS MAJESTY'S STATIONERY OFFICE,
By The South Essex Recorders, Ltd., High Road, Ilford.

(654) Wt. 92/33 925 10/33 S.E.R. Ltd. Gp. 9

BULLETIN OF MISCELLANEOUS
INFORMATION No. 9 1933
ROYAL BOTANIC GARDENS, KEW

LII—THE VEGETATION OF SCHOEMANSKLOOF, EASTERN TRANSVAAL.

J. C. SMUTS.

We have much pleasure in publishing in the "Kew Bulletin" an article by the Right Honourable J. C. Smuts, F.R.S., whose interest in botany is well known. The paper is printed as written by the author except that a few of the names given in the field have been revised after comparison in the Herbarium.

The discovery by General Smuts of five* new species of flowering plants during so brief a visit to the Eastern Transvaal shows how valuable may be such botanical excursions into the less-known parts of Southern Africa.

A set of the specimens has been presented to Kew. A. W. H.

Schoemanskloof.

I was in the Kloof from 7th to 12th June 1932, and collected at various spots to be mentioned later. The Kloof is just below the highveld on the Machadodorp-Lydenburg road, and while itself fairly deep rises in steep slopes to the Drakensberg all around, and thus gives scope for a variety of altitudes and plant forms. Everywhere ancient terraces on the hillsides point to an ancient Bantu or even pre-Bantu people having densely occupied the valley. In fact these terraces followed me all the way in all the Drakensberg valleys and hill-slopes I examined. Four plants were in flower everywhere and gave a pleasant appearance to the otherwise winter aspect: *Iboza riparia, Sutera grandiflora,* a broad-leaved *Athrixia, A. phylicoides* (see p. 425) and a tall large-leaved *Vernonia, V. podocoma* (see p. 425). To these have to be added the Aloes mentioned below.

The first locality where I collected was about 4 or 5 miles down the valley at the trading store on Somerset. Here the soil was red turf, from decomposed diabase, and in a rainstorm which occurred the soil became a badly clinging clay. The stream-banks were covered with *Combretum erythrophyllum* and *Eugenia cordata,* while just beyond was tall grass with much *Acacia caffra* and occasional *Peltophorum africanum* interspersed. A little higher on the hill-slopes were almost pure stands of *Aloe Marlothii* with occasional *Pterocarpus angolensis.* Tall *Ficus* (2) and *Eugenia cordata* were also found growing isolated on the dry hill-sides.

In the gorges rising out of the valley were growing *Ficus, Pyrenacantha, Royena lucida,* a *Euclea, Myrsine africana, Ximenia*

---

* Including *Helichrysum Summomontanum* Verdoorn in Flowering Plants of South Africa, pl. 483 (1933).

americana, *Rhamnus prinoides* and *R. Zeyheri*, *Chrysophyllum magalismontanum* (but no *Mimusops*), *Zizyphus mucronata*, *Sclerocarya caffra*, and scattered *Bauhinia punctata* (see p. 422) in the tall grass, with two species of *Mucuna*. I saw on the open slopes a good deal of *Dicoma Zeyheri* and *D. anomala*, *Geigeria Burkei* and other Composites. I saw four Aloes, *A. Marlothii* and *A. arborescens*, one form with long greenish spike of small flowers, and a common low-growing one with large panicles. Two Cussonias were also seen—one green with mostly entire leaves, the other glaucous with deeply lobed leaves.

My next collecting place was three miles further down the valley where the road crosses the drift near sharp cliffs. Here the forms were more subtropical (alt. from 4000 to 4400 ft.) and the dominant trees were *Bauhinia*, *Eugenia*, *Pterocarpus*, while on the dry slopes *Acacia caffra* was still very common. A tall *Ficus* with white grey stem was also common. In the bush which grows up the escarpment the dominant tree was *Maesa rufescens*. I also saw *Pittosporum viridiflorum*, *Chrysophyllum*, several Combretums, again the two Cussonias, and several *Euphorbia ingens* trees, particularly tall and large. Also *Clerodendron glabrum* (very common), *Gardenia*, *Vangueria infausta*, etc. I saw *Sphedamnocarpus* sp. near *S. pruriens* in the bushes, and the usual grasses, *Andropogon*, *Cymbopogon*, *Trichopteryx*, *Setaria*, *Triraphis*, *Erianthus*, etc. A tall (3 or 4 ft.) *Argyrolobium* with large leaves was very common (without flowers). On the escarpment I found a very small *Mesembryanthemum* new to me, but I fear it has been lost from my collection.

A gorge about a mile further on was full of interesting forms which would be well worth exploring in summer. Here I saw *Celtis*, *Pittosporum*, *Bowkeria*, *Ficus* and *Eugenia*, *Acacia pennata*, etc. The red cliffs were covered with white *Ficus* and *Euphorbia ingens* and *Chrysophyllum*, while the top of the escarpment was green with *Aloe Marlothii*, *Acacia* and *Sclerocarya*. So far a rich diabase soil was found.

At my next stop at Sterkspruit (N. of Bos'shop) the soil was sandstone and the altitude had fallen to 3,300 ft. By the road, besides *Bauhinia* and *Eugenia*, I now found a large-leaved *Faurea* which continued all the way into the low veld; also a large-leaved *Combretum*. A little higher up the slope I found *Chrysophyllum* (*C. magalismontanum*) dominant interspersed with *Pterocarpus angolensis*, *Aloe Marlothii*, several species of *Rhus* (*R. pyroides* and *R. Rogersii*), a light-coloured Acacia with double spikes and long pods, another with maroon pods, a pretty red Labiate in the undergrowth, again the two Cussonias, *Ximenia americana*, *Dombeya*, *Gymnosporia buxifolia*, *Sclerocarya* and *Clerodendron glabrum* in plenty. Hillsides continued terraced out very elaborately. A *Combretum* with a silvery leaf was found; a xerophytic *Ficus* grew all the way up; and on top a grass plateau.

At Sterkspruit the Schoemans valley debouches into the valley of the Crocodile River. Here the scenery was most magnificent—a jumble of great mountains and deep river valleys and gorges. I crossed the Crocodile over the bridge at the Indian store and then passed up the valley on the other side and camped at the foot of the highest mountain in that vicinity (Erasmus farm on Rietvlei). I climbed the mountain (5300 ft. by the aneroid), and saw two Proteas on top, one with a small leaf, *P. abyssinica*, and another with much larger leaf, like the Cape *P. grandiflora*. The farmers told me there were two distinct forms.

At 5000 ft. I skirted a forest, where I collected *Rapanea melanophloeos, Curtisia faginea, Cephalanthus natalensis, Burchellia capensis, Lachnopylis*, etc. On top of the mountain was a pure *Trichopteryx* association, a little lower mixed with *Monocymbiums*, and still lower —at about 4000 ft.—*Themeda triandra*. Lower still were *Acacia* (much *A. giraffae*), *Eugenia*, and *Pterocarpus*.

Passing from the Houtbosloop river, which flows to Alkmaar Station, I collected at Rivulets, where I found the hill-slopes covered with tall grass and *Pterocarpus*, and the river banks with *Adina Galpinii* in beautiful high straight-growing trees; on the rocky slopes *Euphorbia ingens, Chrysophyllum*, etc. This type of vegetation continues all the way to Alkmaar. Here the red turf gives way to a poor granite soil which continues to White River and Rosehaugh. I camped on a donga near Rosehaugh and collected *Cyathea Dregei, Pittosporum viridiflorum* (see p. 421), *Maesa rufescens, Eugenia, Erica drakensbergensis, Bowkeria cymosa, Pterocarpus* and *Ficus*; *Cussonia* and *Cephalanthus natalensis* were both very common, also *Royena* and *Euclea*.

Passing on to Sabie and Graskop my next collection was made at the causeway on the river just before Bushbuckridge, where the Low-veld at about 2000 feet is reached. Below the Konyns Pass, I found first about 10 miles of grass veld with scattered tree forms; then a *Parinari mobola** formation was entered into, with other tree-forms, continued all the way to Acornhoek. Besides *Parinari* I noticed here *Sclerocarya, Terminalia sericea*, an Acacia with much-curled pods, *Acacia giraffae, Trichilia emetica, Maesa rufescens*, a large-leaved *Bauhinia* (*reticulata*?) and *Erythrina caffra*.

Coming back to the Sabie I went up the valley which leads to Mount Anderson. In this valley I saw again the *Pyrenacantha*, with small flowers, *Maesa, Cephalanthus, Rhus, Eugenia* and *Gymnosporia*. I had no time for a fuller examination. Going up the pass I found a mixed grass veld on top, 7000 ft. I climbed Mt. Anderson (aneroid 7300 ft.) and saw two Helichrysums, one canescent, the other an arborescent form or bush several feet in diameter, *Erica arborea* in plenty, and several other species of plants which I have not pressed. The same night at 10.15 I reached Irene.

---

* This is probably the same *Parinari* of which I saw many specimens in the Eastern Zoutpansberg in 1930, and which I found to be *P. curatellifolia* Planch. (see *K.B.* 1931, 243).—J. H.

List of plants collected by General J. C. Smuts at Schoemanskloof, Eastern Transvaal, except where otherwise indicated.

The complete list of plants actually collected by General Smuts is given here, which, together with those mentioned in his paper, may prove useful to other botanists visiting this region about the same season of the year. Although the General spent only a few days collecting, he has brought to light some new species and some not previously recorded from the Transvaal. It is very probable that an intensive survey of the mountains and valleys of the Eastern Transvaal during the flowering and fruiting season would yield much of very great interest, for they seem to carry a flora which is not quite tropical and not typically Cape, but a little of both, with a considerable endemic element. The plant associations, therefore, must be of very great interest. And whilst we have a fair idea of the latitudinal range of the species on these mountains and on the eastern escarpment of the great African plateau, we know very little of their altitudinal range.

The collection was named tentatively at the National Herbarium, Pretoria, and nearly all have been verified at Kew with authentic or type specimens. I have added here and there a few notes on distribution gleaned whilst comparing the plants. J.H.

POLYPODIACEAE: **Cheilanthes multifida** *Sw.*; no. 38B, from Mt. Anderson. **Cyathea Dregei** *Kunze*; no. 86. **Polystichum Macleaii** (*Bak.*) *Diels*; no. 38, from Mt. Anderson. **Pteridium aquilinum** (*Linn.*) *Kuhn*; no. 86A.

SCHIZAEACEAE: **Mohria caffrorum** *Desv.*; no. 1; no. 38A, from Mt. Anderson.

CYCADACEAE: **Encephalartos lanatus** *Stapf et B. Davy*; no. 285.—only found in the Eastern Transvaal, from Middelburg through the Godwan River districts to Barberton.

RANUNCULACEAE: **Clematis brachiata** *Thunb.*; no. 282.

POLYGALACEAE: **Polygala virgata** *Thunb.*; nos. 88; 272.

CRASSULACEAE: **Crassula retrorsa** *Hutch.* n. sp.;* no. 48, Mt. Anderson. **C. parvisepala** *Schonl.*; no. 269A.—A shrubby species 2–3 ft. high, with sweet scented, white flowers; confined to the mountains of the Eastern Transvaal, and collected in the same locality by *Wilms* (no. 516) in 1888. **Kalanchoe rotundifolia** *Harv.*; no. 25.

---

* **Crassula retrorsa** *Hutch.* sp. nov.; affinis *C. abyssinicae* var. *transvaalensi* Schonl., sed foliis brevioribus infra reflexim setuloso-papillosis differt.

Herba 15–20 cm. alta, erecta; caulis laxe foliatus, pilis strigillosis albidis deflexis indutus. *Folia* anguste oblongo-lanceolata, basin versus connata, 2–3 cm. longa, usque ad 1 cm. lata, supra glabra, infra setulis deflexis laxe induta, marginibus dense papilloso-ciliolatis. *Cymae* densiflorae, circiter 3 cm. diametro; bracteae lanceolatae, papilloso-ciliatae; pedicelli usque ad 5 mm. longi, glabri. *Sepala* anguste triangulari-lanceolata, apiculato-acuminata, 2·5 mm. longa, glabra. *Petala* oblonga, acuta, 4 mm. longa, 1·25 mm. lata, glabra. *Stamina* petalis breviora. *Carpella* 5, longe apiculata.

Eastern Transvaal: Mt. Anderson, *Smuts* 48 (type).

PHYTOLACCACEAE: **Phytolacca stricta** *Hoffm.*; no. 68.

THYMELAEACEAE: **Lasiosiphon capitatus** (*L.f.*) *B. Davy*; no. 257. **Passerina montana** *Thoday*; no. 91, from Rosehaugh.

PROTEACEAE: **Faurea speciosa** *Welw.*; no. 52.—This fine species ranges through the dry forest area of the plateau region to Angola and northwards through Rhodesia and East Africa, also occurring on the interesting remnant of the plateau in Northern Nigeria, the Bauchi plateau. **Protea abyssinica** *Willd.*; no. 277; and no 97A, from Rietvlei.—Extends to Angola and N. W. Rhodesia, through the East African Mountains to Abyssinia.

PITTOSPORACEAE: **Pittosporum viridiflorum** *Sims*; no. 291.—This has a very wide distribution; it occurs in Angola and Eastern Rhodesia, and follows the forest patches from the Central Zoutpansberg and through the eastern districts to Knysna; it is recorded also from the hills around Pretoria. The attractive shiny seeds are probably distributed by birds.

OCHNACEAE: **Ochna natalitia** *Engl.*; no. 334.

MELASTOMACEAE: **Dissotis incana** *Triana*; no. 313.

COMBRETACEAE: **Combretum gazense** *Swynn. et Bak. f.*; no. 56.—This extends the distribution of the species considerably southward, the nearest point hitherto having been Wylie's Poort in the Central Zoutpansberg; thence it is found northwards as far as the Katanga. **C. holosericeum** *Sond.*; no. 57; no. 71, from Rosehaugh.

HYPERICACEAE: **Hypericum aethiopicum** *Thunb.*; no. 29, from Rietvlei, Crocodile River.

STERCULIACEAE: **Dombeya pulchra** *N. E. Br.*; no. 263.—Confined to this part of the Eastern Transvaal. **Hermannia montana** *N. E. Br.*; no. 28, from Rietvlei, Crocodile River.

MALVACEAE: **Hibiscus trionum** *Linn.*; no. 94.

MALPIGHIACEAE: **Sphedamnocarpus** sp., allied to *S. pruriens Planch.*; no. 298.—The specimen is in fruit and I have not been able to determine it satisfactorily; possibly an undescribed species.

EUPHORBIACEAE: **Jatropha latifolia** *Pax*; no. 90, from Rosehaugh.

GREYIACEAE: **Greyia Radlkoferi** *Szyszl.*; no. 268.

ESCALLONIACEAE; **Choristylis rhamnoides** *Haw.*; no. 288.—An interesting genus of two species endemic to the montane region of Eastern Africa ; when out of flower much resembling *Rhamnaceae*. *C. rhamnoides* ranges from the woods of the Katberg through Natal as far north as Houtbosh (Woodbush). Then apparently there is a gap, and from the Melsetter district of Eastern Rhodesia, the second species, *C. shirensis* Bak. f., takes its place, extending northwards as far as the Kinga Mts. in Southern Tanganyika.

ROSACEAE : **Cliffortia linearifolia** *Eckl. et Zeyh.* ; no. 42, from Mt. Anderson.

CAESALPINIACEAE : **Bauhinia punctata** *Bolle* (*B. Galpinii* N. E. Br.) ; no. 307.—Unfortunately this plant has to bear the older name given by Bolle ; this is regrettable after it has become so well known to Transvaal botanists under the name given to it by N. E. Brown.

MIMOSACEAE : **Acacia ataxacantha** *DC.* ; nos. 51 ; 271. **A. campylacantha** *Hochst.* ; no. 262. **A. karroo** *Hayne* ; no. 62. **A. Woodii** *Burtt Davy* ; nos. 306 ; 325. **Dichrostachys glomerata** (*Forsk.*) *Chiov.* ; no. 65, from Rietvlei, Crocodile River.

PAPILIONACEAE : **Dalbergia armata** *E. Mey.* ; no. 256. **Pterocarpus angolensis** *DC.* ; no. 259. **Mundulea suberosa** *Benth.* ; no. 55A. **Indigofera Garckeana** *Vatke* ; no. 92.—A new record from the Transvaal ; hitherto known only from Rhodesia northwards to the Nile districts. **I. perplexa** *N. E. Br.* ; no. 302.—A very rare and little known species. **Rhynchosia komatiensis** *Harms* ; no. 37. **Flemingia Grahamiana** *W. et A.* ; nos. 12 and 36.—This is a most interesting species with a remarkably wide distribution. It follows the plateau and lower parts of the mountains from the north eastern Transvaal through north western Rhodesia to the Shari, and East Africa generally ; it has been found in Arabia, at 6000 ft., about 50 miles north of Aden, and reappears in Southern India ; and the French Missionaries have collected it as far away as Tapintze in Yunnan, Western China. This wide distribution is rather remarkable for such a distinct looking species. It contains a yellow dye, which spreads over the mounted sheet after poisoning. **Pseudarthria Hookeri** *W. et A.*; no. 301. **Eriosema psoraleoides** *Don* ; no. 67, from Rosehaugh.—Up to a few years ago this common and widely spread species was known as *E. cajanoides* Benth., but the older specific name has now to be used under international rules. **Erythrina lysistemon** *Hutch.*, new sp. ;* no. 66, from Rietvlei, Crocodile River.—A critical examination of General Smuts' plant has shown that the specimens from the Transvaal previously referred to *E. caffra* Thunb. represent a distinct species. Superficially the two species are very much alike, but I was induced to investigate further on account of the small and narrower vexillum and the peculiar shape of the leaflets of the Transvaal plant. That these were of importance was revealed on dissection, for in the new species the vexillary stamen was found to be quite free from the split staminal tube, whilst in *E. caffra* it is adnate to it below the middle. *E. caffra* is thus shown to occupy an area in Southern Africa from Uitenhage through the hills of the lower coastal belt east of the Drakensberg escarpment to Eastern Rhodesia. Mr. Jan Gillett and I also collected this new species in July 1930, in the Zoutpansberg, on low hill sides, where we found several trees in the bare grassy veld about nine miles east of Louis Trichardt, alt. 3000 ft. I remember these trees very well, for they caught our attention fully a mile away with their scarlet flowers, much visited by bees, and almost leafless at the time of flowering (*Hutch. et Gillett* no. 4155).—J. H. **Pearsonia propinqua** *Dummer*; nos. 95; 293.—Another very rare species. **Argyrolobium** sp. nov.? near *A. Wilmsii* Harms; a very distinct species of which further material is desired; grows socially, and up to 3 ft. high; no flowers collected; no. 327.

---

* **Erythrina lysistemon** *Hutch.* sp. nov. ; affinis *E. caffrae* Thunb., sed forma foliorum, vexillo angustiore, stamino vexillare libero differt.

Arbor parva, usque ad 7 m. alta ; ramuli aculeis brevibus armati. *Folia* post anthesin producta ; foliola ambitu rhomboidea, basi latissime cuneata, superne longe et late acuminata, lobis lateralibus a costa angulo recto patentibus oblongo-rotundatis, usque ad 10 cm. longa et 8 cm. lata, utrinque glabra, basi conspicue trinervia ; petioli circiter 5 mm. longi, basi glandula carnosa instructi. *Racemi* longe pedunculati, pedunculis et axi inflorescentiae plus minusve tomentosis ; pedicelli brevissimi. *Flores* reflexi, rubri.

MYRICACEAE: **Myrica conifera** *Burm.* f.; no. 96, from Bushbuckridge river.

MORACEAE: **Ficus ingens** *Miq.*; no. 295. **F. Sonderi** *Miq.*; no. 82.

AQUIFOLIACEAE: **Ilex mitis** (*Linn.*) *Radlk.*; no. 69.

CELASTRACEAE: **Cassinopsis ilicifolia** *O. Kuntze* (*O. capensis* Sond.); nos. 252; 329; 331.—Widely spread in South Africa, from the Cape district to Swaziland. **Pterocelastrus Galpinii** *Loes.*; nos. 22 and 99, from Rietvlei.—Only one specimen at Kew and that in fruit; described originally from Rimer's Creek, Barberton.

ICACINACEAE: **Apodytes dimidiata** *E. Mey.*; no. 274.—Extends through East Africa to Eritrea and southwards through the Knysna forest to the Cape.

Calyx bilabiatus, 1·3 cm. longus, fere ad medium divisus, extra laxe pubescens. *Vexillum* oblanceolatum, circiter 5 cm. longum et 2·5 cm. latum, multistriatum. *Alae* leviter oblique oblongae, late et brevissime unguiculatae circiter 1·3 cm. longae et 4 mm. latae. *Petala* carinae late elliptica, circiter 1 cm. longa. *Stamem* vexillare ad basin liber; antherae 3·5 mm. longae. *Ovarium* longe stipitatum, appresse tomentellum, multiovulatum, stylo glabro. *Fructus* [incompletus] stipitatus, fere glaber, ut videtur moniliformis.

Eastern Transvaal: Rietvlei, Crocodile River, June 1932, *Smuts* 66 (type). Macalisberg, Aug., *Burke*. Pretoria district, *Nelson* 84. Rustenburg, *Nation*. Zoutpansberg, 9 miles south-east of Louis Trichardt, 3000 ft., tree 50 ft., flowers scarlet, visited by bees, *Hutchinson et Gillett* 4155.

RHAMNACEAE : **Rhamnus prinoides** *L'Herit.* ; no. 320.—Another very widely spread shrub, reaching Abyssinia and the Cameroons in the north, and south to Cape Province. **R. Zeyheri** *Sond.* ; no. 324.

AMPELIDACEAE : **Rhoicissus digitata** (*L.f.*) *Gilg. et Brandt* ; no. 54A.—South to Riversdale, where it grows in the bush at sea level, and north to Eastern Rhodesia. **R. cuneifolia** (*E. & Z.*) *Planch.* ; no. 275.

SIMARUBACEAE : **Hippobromus pauciflorus** (*L.*) *Radlk.* ; no. 276. —Ranges from Humansdorp through the Eastern districts to the Barberton district.

SAPINDACEAE : **Pappea fulva** *Conrath* ; no. 61.—Very closely allied to the widely spread *P. capensis* Eck. et Zeyh.

ANACARDIACEAE : **Rhus Legatii** *Schonl.* ; no. 55.—Extends southwards to the Zuurberg and Swellendam. **R. Pentheri** *Zahlbr.* ; nos. 296 ; 323. **R. pyroides** *Burch.* ; no. 34, from Rietvlei. **R. Rehmanniana** *Engl.* ; nos. 254 ; 319. **R. Rogersii** *Schonl.* ; no. 292.

CORNACEAE : **Curtisia faginea** *Ait.* ; no. 11, from Rietvlei.—Ranges from Eastern Rhodesia through the eastern mountain forests to Table Mountain.

ARALIACEAE : **Cussonia spicata** *Thunb.* ; no. 289.

ERICACEAE : **Erica drakensbergensis** *Guthrie et Bolus* ; no. 87, from Rosehaugh.

VACCINIACEAE : **Vaccinium exul** *Bolus* ; no. 40, from Mt. Anderson.—Only found in the mountains of the Eastern Transvaal. There are only three species of *Vaccinaceae* in Africa, *V. Stanleyi* Schott on Mt. Ruwenzori and the Virunga Mts., *V. africanum* Britten from Mt. Milanji and the Nyasa Plateau, and that enumerated here. There are in addition a few species on the ancient plateau region of Madagascar.

EBENACEAE : **Euclea** sp. near *E. natalensis* A.DC. ; nos. 297 ; 301A ; in fruit only. **E.** sp. near *E. lanceolata* E. Mey. ; nos. 14 ; 100, from Rietvlei. **Royena lucida** *Linn.* ; no. 321 ; no. 84 ; from Rosehaugh.

SAPOTACEAE : **Chrysophyllum magalismontanum** *Sond.* ; nos. 59 ; 60 ; and no. 70, from Rosehaugh.

MYRSINACEAE : *Myrsine africana* Linn. ; no. 39. **Maesa rufescens** *DC.* ; no. 89, from Rosehaugh ; no. 290. **Rapanea melanophloeos** (*R. Br.*) *Mez* ; no. 23, from Rietvlei ; no. 70A from Rosehaugh.—Ranges from the Zoutpansberg through Natal to the Eastern Cape.

LOGANIACEAE: **Buddleja auriculata** *Benth.* var. **euryifolia** *Prain*; no. 58, from Mt. Anderson; nos. 273; 315. **B. salvifolia** *Lam.*; no. 50, from Mt. Anderson. **Lachnopylis pubescens** (*Sond.*) *C. A. Smith*; no. 9, from Rietvlei. **Lachnopylis floribunda** (*Benth.*) *C. A. Smith*; no. 18, from Rietvlei. **Gomphostigma virgatum** (*L.f.*) *O. Kuntze*; no. 33, from Rietvlei.

RUBIACEAE: **Gardenia globosa** *Hochst.*; no. 73, from Rosehaugh. **G. Rothmannia** *Linn. f.*; no. 97. **Burchellia capensis** *R. Br.*; no. 24, from Rietvlei. **Cephalanthus natalensis** *Oliv.*; no. 21, from Rietvlei.—Extends from Natal to the Melsetter district of Eastern Rhodesia. **Pentanisia variabilis** *Haw.*; no. 31. **Grumilea capensis** *Sond.*; no. 333.

DIPSACACEAE: **Scabiosa Columbaria** *Linn.*; no. 78, from Rosehaugh.

COMPOSITAE: **Vernonia podocoma** *Sch. Bip.*; nos. 280; 316; 317.—A very handsome species up to 10 ft. high with large corymbs of small crowded flower-heads. I saw an abundance of this species by the road through the foothills of the Zoutpansberg in Aug. 1930. It is very widely distributed in tropical Africa, in Angola and Rhodesia, reappearing in the mountains of Abyssinia; so far not recorded from the intervening territory; in S. Africa otherwise only in the Eastern Transvaal and Zululand.—J. H. **V. Kraussii** Sch. Bip.; no. 318. **Aster Bakerianus** *Burtt Davy*; no. 267. **A. Harveyanus** *O. Ktze*; no. 2. **Tarchonanthus Galpinii** *Phillips*; no. 13, from Reitvlei. **Laggera alata** *Sch. Bip.*; no. 314. **Cassinia phylicifolia** (*DC.*) *J. M. Wood*; no. 342. **Helichrysum adenocarpum** *DC.*; no. 43, from Mt. Anderson. **H. Kraussii** *Sch. Bip.*; no. 332. **H. lepidissimum** *S. Moore*; no. 47, from Mt. Anderson. **H. setosum** *Harv.*; no. 56A. **H. splendidum** *Less.*; no. 45, from Mt. Anderson. **H. decorum** *DC.*; no. 19, from Rietvlei; no. 269B. **H. summomontanum** *Verdoorn*; no. 44, from Mt. Anderson; a new species described and figured in the Flowering Plants of South Africa, pl. 483 (1933). **Anisopappus Smutsii** *Hutch.* n. sp.*; no. 17, from Rietvlei. **Athrixia phylicoides** *DC.*

***Anisopappus Smutsii** *Hutch.* sp. nov.; affinis *A. Junodii* Hutch., sed foliis inferne leviter cuneatis integris superne parce et remote dentatis infra vix reticulatis capitulis plerumque subsessilibus differt.

Frutex; rami costati, albido-tomentelli, flexuosi. *Folia* discoloria, ovato-lanceolata, basi leviter cuneata, apice triangulari-subacuta, 3·5–5 cm. longa, 1·5–2·5 cm. lata, supra minute puberula, infra molliter albido-tomentosa, basi prominenter trinervia; petioli circiter 1 cm. longi, leviter foliacei-alati. *Capitula* pauca, cymoso-corymbosa, subsessilia. *Involucri bracteae* circiter 5-seriatae, late lanceolatae, acutae, gradatim longiores, usque ad 0·8 cm. longae, inferiores lanato-tomentosae, superiores puberulae apicem versus ciliatae. *Receptaculum* paleaceum, paleis oblongo-linearibus superne ciliatis 7 mm. longis. *Flores radii* circiter 10; corollae tubus gracilis, 3 mm. longus, parce puberulus, limbo oblongo 8 mm. longo apice tridentato. *Flores disci* numerosi; corollae tubus parce puberulus. *Achaenia* 4-costata, parce pubescentia. *Pappus* paleaceus, paleis irregulariter laciniatis.

Eastern Transvaal: Rietvlei, 12 June 1932, *Smuts* 17 (type).

no. 278; 335A.—This genus of *Compositae* is richly represented by several species in this part of Africa, and there are two species in the districts around the Cape. It has an interesting austral distribution, being found also in Madagascar and Australia; in tropical Africa the genus occurs on the eastern plateau as far north as the Southern Sudan and Abyssinica. **Geigeria Burkei** *Harv.*; no. 344. **Athanasia acerosa** *Harv.*; no. 85, from Rosehaugh. **Senecio microglossus** *DC.*; no 253. **Lopholaena disticha** (*N. E. Br.*) *S. Moore*; no. 305; **Dimorphotheca nervosa** *Hutch.* n. sp.*; no. 16, from Rietvlei.—A very distinct species with the habit rather of an *Osteospermum* than a *Dimorphotheca*; but the one-seriate involucral bracts determine it to be the latter genus. **Berkheya subulata** *Harv.*; nos. 20; 27, from Rietvlei. **Gazania pygmaea** *Sond.*; no. 10. **Dicoma Zeyheri** *Sond.*; no. 326. **Gerbera Jamesonii** *Bolus*; no. 335, common. **G. discolor** *Sond.*; no. 26, from Rietvlei.

GENTIANACEAE: **Sebaea Schinziana** *Gilg*; no. 49, from Mt. Anderson.

CAMPANULACEAE: **Wahlenbergia undulata** *A. DC.*; no. 283.

SOLANACEAE: **Solanum rigescens** *Jacq.*; no. 284. **S. aculeastrum** *Dunal*; no. 32, from Rietvlei.

SCROPHULARIACEAE: **Sutera floribunda** *O. Ktze.*; no. 7, from Rietvlei. **S. grandiflora** *Hiern*; nos. 279; 300; 328. **Halleria lucida** *Linn.*; no. 260; 310; 311; 312. **Bowkeria cymosa** *MacOwan*; no 287.

ACANTHACEAE: **Dicliptera clinopodia** *Nees*; no. 64; nos. 80; 93, from Rosehaugh. **Phaylopsis parviflora** *Willd.*; no. 76A, from Rosehaugh. **Hypoestes verticillaris** *R. Br.*; no. 294.

SELAGINACEAE: **Selago aggregata** *Rolfe*; nos. 6; 15, from Rietvlei. **S. elata** *Rolfe*; no. 76, from Rosehaugh. **S. Wilmsii** *Rolfe*; no. 3, from hill near Rietvlei, 5300 ft.

LABIATAE: **Iboza riparia** *N. E. Br.*; no. 322. **Orthosiphon albiflorus** *N. E. Br.*; no. 5, from Rietvlei. **Plectranthus purpuratus** *Harv.*; nos. 72; 77, from Rosehaugh. **Pycnostachys**

***Dimorphotheca nervosa** *Hutch.* sp. nov.; lignosa, foliis longitudinaliter nervosis valde distincta.

Suffrutex, ramis vetustioribus persistentibus corrugatis; ramuli laxe foliati, flavescentes, papillato-scaberuli. *Folia* anguste lanceolata, apice acute pungentia, basi angustata, 2–4 cm. longa, 4–6 mm. lata, prominenter et longitudinaliter nervosa, inter nervos crebre reticulata, laxe papillato-scabridula. *Capitula* terminalia, solitaria, circiter 2·5 cm. diametro; pedunculi breves, densissime papillati. *Involucri* bracteae 1-seriatae, circiter 8, late lanceolatae, acutae, 6–7 mm. longae, nervosae et papillatae, marginibus membranaceis minute denticulatis. *Flores radii* flavi, circiter 8; corollae tubus puberulus; ligula oblonga, apice tridentata. *Flores disci* brunneo-flavi, numerosi. *Achaenia* matura non visa. *Pappus* nullus.

Eastern Transvaal: Rietvlei, June 1932, *Smuts* 16 (type).

reticulata (*E. Mey*) *Benth.*; no. 53A. **Salvia coccinea** *Juss.*; no. 63, introduced.

LILIACEAE: **Aloe affinis** *Berg.*; no. 309. **A. arborescens** *Mill.*?; nos. 8, 270.

SMILACACEAE: **Smilax Kraussiana** *Meisn.*; nos. 303; 330.

GRAMINEAE: **Alloteropsis semialata** (*R. Br.*) *Hitchc.*; no. 261. **Andropogon eucomis** *Nees*; no. 336. **Brachiaria brizantha** *Stapf.*; no. 251. **Stiburus alopecuroides** (*Hack.*) *Stapf*; no. 39A, from Mt. Anderson.

LIII—THE GENUS TRICHOCLADUS Pers. (HAMAMELIDACEAE).

J. HUTCHINSON.

The family *Hamamelidaceae* is of considerable interest both phytogeographically and phylogenetically. Like the ancient *Magnoliaceae* its main centres of distribution are Eastern Asia and the Eastern United States of North America, a few genera of both families extending into the northern tropics. *Hamamelidaceae* seems to be an advanced group of the *Rosales*, and something of a stepping-stone between that great alliance and the so-called "Amentiferae."

With the exception of *Trichocladus* and two small genera in the Mascarene Islands (*Dicoryphe* and *Franchetia* Baill.), and a little known genus, *Ostrearia* Baill. in north-eastern Queensland, the family *Hamamelidaceae* is confined to the Northern Hemisphere. Its presence in the Southern Hemisphere, therefore, is probably due to migration from the north, the more temperate mountain ranges of the eastern half of Africa having provided the path of dispersal, *Trichocladus* being found in the forests from Harar, in Abyssinia, to as far south as the Knysna forests in Southern Africa.

In relation to the general distribution of the family, *Trichocladus* thus recalls that of *Berberis* and *Cornus*, which in the Old World are mainly in the Northern Hemisphere, but which have penetrated only as far south as the mountains of Tanganyika. These same mountains have also provided the means for the spread of families which have found their origin in the Southern Hemisphere, such as *Proteaceae*, which have migrated northwards as far as Abyssinia.

The most widely spread species of *Trichocladus* is *T. malosanus* Baker, which occurs in Harar, Abyssinia, and is common in the forests of Kenya, Tanganyika, and Nyasaland, becoming rarer in Katanga and Northern Rhodesia. There are two species found in the Kyimbila district to the north of Lake Nyasa, *T. Goetzei* Engl. and *T. dentatus* Hutch., the latter described here for the first time. *T. grandiflorus* Oliv. is a handsome-flowered species, which is confined to the north-eastern Transvaal, whilst *T. ellipticus* Eckl. & Zeyh. and *T. crinitus* Pers. occur in the forests from Natal to George.

Assuming that the family has arisen from the *Rosales* stock, those genera of *Hamamelidaceae* which still have petals, such as the well-known *Hamamelis* itself, would probably be the most ancient, and to this group *Trichocladus** belongs. Although the presence of petals indicates an ancient type, the inflorescence of most of the species of *Trichocladus* is considerably advanced, being *capitate*. In regard to the type of inflorescence, *T. grandiflorus* is the most primitive species; in this it is *spicate*. It is noteworthy that two of the species with the greatest number of advanced characters are found only at the southern limit of distribution, these being *T. crinitus* and *T. ellipticus*, and in both these the character of the indumentum, which is densely stellate, may be also regarded as being of an advanced type.

Key to the Species.

Mature leaves glabrous or nearly so below; petals rather broad, their margins not recurved:
  Flowers shortly spicate; leaves acuminate, not peltate, entire.... 1. *grandiflorus*.
  Flowers capitate:
    Leaves rounded at the apex, not peltate at the rounded base, entire..2. *Goetzei*.
    Leaves acuminate, peltate at the base, obtusely repand-dentate in the upper half..3. *dentatus*.
Mature leaves more or less stellate-pubescent or tomentose below; flowers capitate; petals rather narrow, with recurved margins:
  Leaves peltate, loosely stellate-pubescent below; branchlets covered with rather long dark-brown hairs............4. *crinitus*.
  Leaves not or only very inconspicuously peltate, densely and very shortly stellate-tomentose below:
    Leaves broadly elliptic, triangular at each end, rather large, averaging about 7–10 cm. long and 4–6 cm. broad; flower-heads rather large, solitary at the end of each shoot........... 5. *malosanus*.
    Leaves lanceolate or lanceolate-elliptic, rather long-pointed at each end, somewhat small, averaging 3–5 cm. long and 1·5–2·5 cm. broad; flower-heads small, terminal and often also in the upper leaf-axils..........................6. *ellipticus*.

1. **T. grandiflorus** *Oliv.* in Hook. Ic. Pl. t. 1480 (1885).

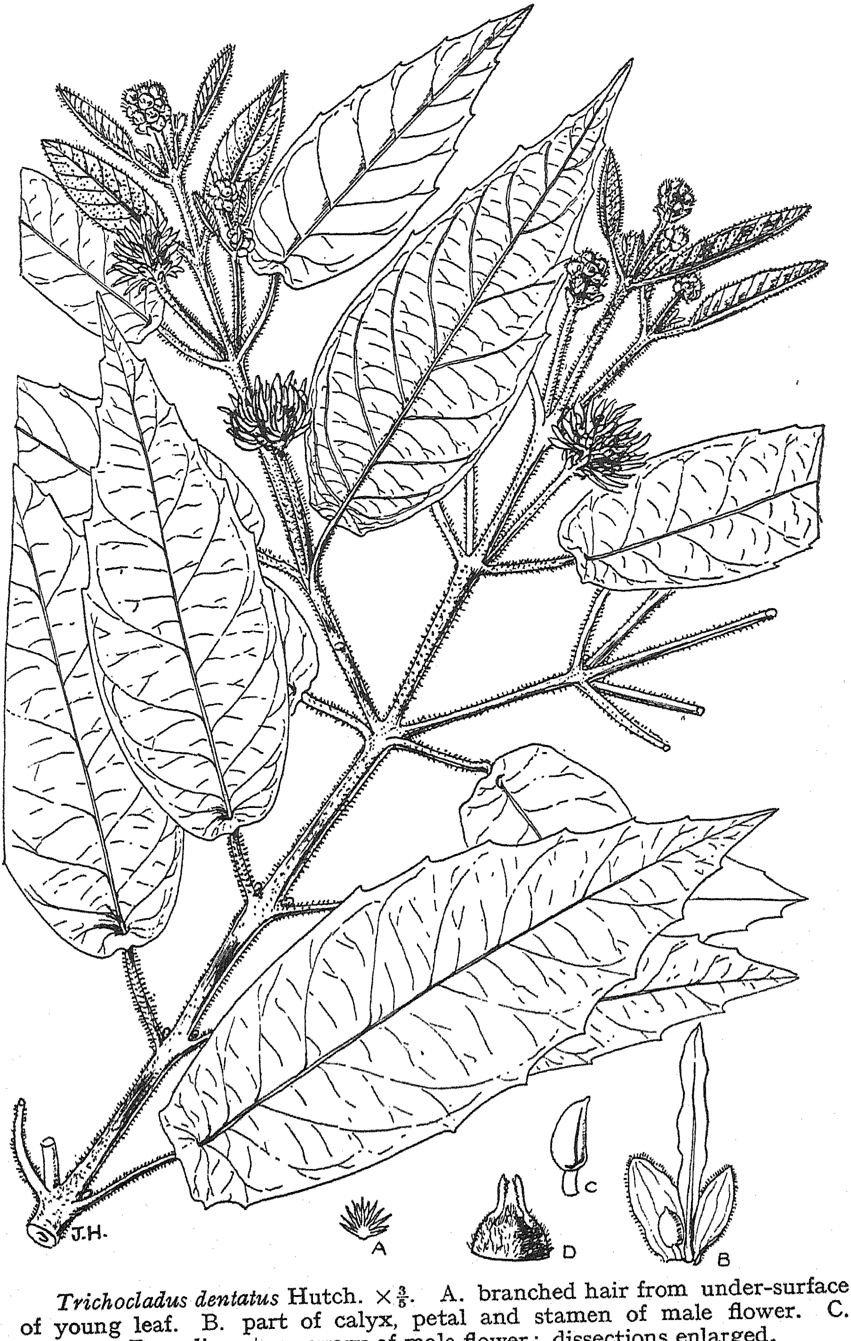
South Africa: Eastern Transvaal; forests of Lydenburg District and Barberton. Exsicc.—*Rogers* 22999; *Burtt Davy* 1480; 1650; *Galpin* 553; *Royston* 4084. *Mudd* (type).

2. **T. Goetzei** *Engl.* Bot. Jahrb. **49**, 455, fig. 1, A-G (1913).

Tanganyika Territory: Uhehe Distr.; Utschungwe Mts., near Kissinga, fl. and fr. Feb., *Goetze* 574 (type). Kyimbila Distr.; Rungwe Crater, tree-like, 24 ft., fl. Jan., *Stolz* 1067.

---

*Petals are absent from the female flowers of *Trichocladus*.



Trichocladus dentatus Hutch. ×$\frac{3}{5}$. A. branched hair from under-surface of young leaf. B. part of calyx, petal and stamen of male flower. C. stamen. D. rudimentary ovary of male flower; dissections enlarged.

3. **T. dentatus** *Hutch.* sp. nov.; foliis basi peltatis mox glabrescentibus, floribus capitatis, petalis planis glabris valde distincta.

Frutex vel arbor parva usque ad 4 m. alta; rami annotini infra nodos satis compressi, lenticellati et minute stellato-puberuli, hornotini rufo-tomentelli, internodiis 3–5 cm. longis. *Folia* opposita, late oblongo-lanceolata, acute acuminata, basi leviter peltata et truncato-rotundata, 10–15 cm. longa, 4–6 cm. lata, dimidio superiore obtuse repando-dentata, juniora utrinque rufo-tomentosa, mox glabra vel fere glabra; nervi latearles utrinsecus circiter 10, a costa sub angulo 45° abeuntes, leviter arcuati, intra marginem anastomosantes, inter nervos venis laxe reticulatis; petioli 1·5–2 cm. longi, supra basin versus plani, stellato-tomentelli; stipulae mox caducae, subulatae. *Inflorescentia* ♂ axillaris, capitata, pedunculata, circiter 2–2·5 cm. diametro; pedunculi 2–2·5 cm. longi, rufo-tomentosi; bracteae subulatae. *Calyx* campanulatus, 5 mm. longus, extra stellato-tomentosus, lobis late ovato-triangularibus. *Petala* plana, lineari-oblanceolata, 2 cm. longa, 3 mm. lata, utrinque glabra. *Stamina* 5; filamenta brevissima; antherae crassae, oblique mucronatae, 1·75 mm. longae. *Discus* annularis, pubescens. *Ovarium* rudimentarium tomentosum, stylis 2 brevibus liberis. *Inflorescentia* ♀ et fructus non visus.

Tanganyika Territory: Kyimbila Distr.; Ukinga—Kwakalila, in Bamboo forest, shrub 12 ft., Nov., *Stolz* 2297 (type).

4. **T. crinitus** (*Thunb.*) *Pers.* Synop. **2,** 597 (1807); DC. Prodr. **4,** 269; Sond. in Harv. & Sond. Fl. Cap. **2,** 325; Marloth Fl. S. Afr. **2,** 25, pl. 9, C. *Dahlia crinita* Thunb. in Skrivt. Nat. Selsk. Kiobenh. **2,** 133, t. 4 (1792). *Trichocladus vittatus* Meisn. ex Sond. l.c. in syn. *T. peltatus* Meisn. in Hook. Lond. Journ. Bot. **2,** 537 (1843).

South Africa: Forests of George, Knysna, Uitenhage and Natal.

5. **T. malosanus** *Baker* in Kew Bull. 1897, 266. *T. ellipticus* var. *latifolius* Schweinf. ex Engl. Bot. Jahrb. **49,** 456, fig. 1, H-N.

Widely spread in the forests from Harar (Abyssinia), Uganda, Kenya, Tanganyika, Nyasaland, and probably rarer in the Katanga and Northern Rhodesia.

Hutchins states (in Kew Herb.) that this species forms the chief undergrowth in the Uasin Gishu forests of Kenya, at 7000–8000 ft., whilst Scott-Elliott notes that most of the woods on the Mau plateau are composed of this tree. The flowers are sweet-scented.

6. **T. ellipticus** *Eckl. & Zeyh.* ex *Sond.* in Harv. & Sond. Fl. Cap. **2,** 325 (1862); Marloth Fl. S. Afr. **2**: 25, pl. 9, B.

South Africa: forests of Uitenhage, Albany, Somerset East, King Williamstown (Perie Forest), Bathurst, Transkei, Komgha, Natal.

LIV—PLANT MORPHOLOGY IN ALBERTUS MAGNUS.*

T. A. SPRAGUE.

Albert of Bollstädt (1193–1280), Bishop of Regensburg, generally styled Albertus Magnus, was a voluminous writer, one of whose books dealt with the Vegetable Kingdom. This was his " De vegetabilibus libri VII," edited by Ernst H. F. Meyer and C. Jessen (1867). Our knowledge of the botanical work of Albertus Magnus is due mainly to Ernst Meyer, who published two papers on the subject in Linnaea, **10**, 641–741 (1836), and **11**, 545–595 (1837), and gave a further account in his " Geschichte der Botanik," **4**, 9–84 (1857). Another study on Albertus as a botanist was published by Stephen Fellner in Jahres-Ber. des kais. kön. Ober-Gymnasiums zu den Schotten in Wien (1881)—this, however, I have not seen. For English readers an account in Dr. Agnes Arber's " Herbals " (1912), pp. 3–5, 7, 116, 119, 120, 134–136, is available.

The present paper is based on an intensive study of the botanical terminology employed by Albertus. The explanatory index supplied by Jessen, though extremely helpful, is far from being exhaustive, and some of the meanings of botanical terms given in it appear to be inexact ; thus *germen seminis* usually meant not the embryo as a whole, but the plumule ; *farina seminis*, which Jessen defined as albumen, occurred also in exalbuminous seeds such as those of *Leguminosae* and *Quercus*, where it denoted the food tissue within the cotyledons ; and *panniculus* apparently did not mean the capsule of *Viola* (elsewhere termed *folliculus*), but the cluster into which the seeds are aggregated. A glossary of the botanical terms used by Albertus has been prepared, and will appear shortly.

The general philosophy of Albertus was based on that of Aristotle, while the more strictly botanical part was largely derived indirectly from Theophrastus, through Nicolaus Damascenus and other channels. The book " De Vegetabilibus " consisted of seven chapters, of which the first five were theoretical, while the sixth contained descriptions of individual medicinal and economic species, and the seventh was devoted to agriculture and horticulture.

The species described in the sixth book are in two sections, including woody and herbaceous plants respectively, the plants in each section being arranged in alphabetical order. Albertus apparently thought it necessary to apologise for descending from the heights of philosophy to the description of individual species :—" In hoc sexto libro vegetabilium nostrorum magis satisfacimus curiositati studentium quam philosophiae. De particularibus enim philosophia esse non poterit." Now, after the lapse of nearly seven centuries, it is his descriptions of species that are important, both for identifying the plants concerned and for ascertaining the precise connotation of the terms employed by him. His general philosophy of the Plant World on the other hand, is now of relatively little interest ; his conception of the plant being zoomorphic, he constantly endeavoured to explain its organs and mode of life by means of false analogies drawn from the Animal World. In fact, he seems to have regarded the plant as an imperfect animal.

---

* See Botanical terms in Pliny's Natural History (*K.B.* 1933, 30) ; and Botanical terms in Isidorus (*K.B.* 1933, 401).

Various references to the beliefs of magicians and sorcerers remind us that the book was written in the Middle Ages. A stick of ebony tied to an infant's cradle was said to ward off terrifying apparitions ; the fiercest bulls became tame if tied to a wild fig-tree ; the wood of the medlar was much sought by enchanters for making staffs possessed of special powers ; the juice of poplar leaves had a reputation as a contraceptive, and tying on the root of a pear-tree had the same effect ; students of magic said that willow seed was an antaphrodisiac ; mugwort (*Artemisia vulgaris*), whether carried or tied to the legs, removed the fatigue of wayfarers ; both betony (*Betonica officinalis*) and vervain (*Verbena officinalis*) were used by students of black magic for purposes of divination ; houseleek (*Sempervivum tectorum*) was said to ward off thunderbolts, and was accordingly planted on roofs. Such are some of the beliefs recorded.

The doctrine of the transmutation of species was accepted by Albertus. Wheat became converted into rye, and vice versa, according to the nature of the soil.

Albertus began by discussing whether plants were living and had souls, and gave an affirmative answer on the ground that they fed, grew, reproduced themselves and died, although they did not feel, experience desire, or sleep. He decided that neither separate sexes nor sexual processes existed in plants, but that they were of one sex, both male and female characters being combined in the same individual. Plants called " male " were relatively narrow-leaved, hard and dry, and consequently rough, and produced smaller fruits and seeds. " Female " plants, on the other hand, were relatively broad-leaved, soft and moist, and consequently smooth, and produced larger fruits and seeds.

For purposes of classification, he recognized main groups or " genera " and subordinate ones or " species," these two terms being employed in purely relative senses. Thus the " genus " *planta* was divided into the " species " *arbor, arbustum, olus virens, herba* and *fungus*. Each of these " species " in its turn became a " genus " when considered in relation to groups subordinate to itself. Albertus however, occasionally used the terms " genera " and " species " in their modern biological senses, as for instance when he observed that esula (*Euphorbia*) was not a species but a genus, and that there were many species of solatrum (*Solanum*).

In actual practice, Albertus recognized only two primary " genera " of plants, namely, woody plants (lib. vi, tract. 1) and herbaceous ones (lib. vi, tract. 2). A tree (*arbor*) was a woody plant with a single trunk (*stipes*) from its root, bearing numerous boughs (*rami*), branches and branchlets. A shrub (*arbustum*), on the other hand, had numerous main stems (*stipites* or *rami*) from its root.

Juniper (*Juniperus communis*), however, was classed as a tree, although it was branched from the root, because each of its primary stems (*stipites*) was extensively branched like the trunk of a tree. In a bush (*frutex*) there were many equal and relatively slender branches from the base. When these branches were long and not very woody, a shrub was known by the term *rubus* (e.g. *Hedera Helix*). An arborescent shrub was known as *frutex magnus*. Herbaceous plants were divided into (1) those with leafy stems of considerable size (*olus virens* or *olus*), and (2) those with all or most of the leaves radical (*herba*). Albertus recognized, however, that the distinction between *olus virens* and *herba* broke down in various instances, the beet (*Beta vulgaris*), for example, being a *herba* in its first year, and an *olus virens* afterwards. The term *herba*, moreover, was used in a general sense to include both *olus virens* and *herba* (sensu stricto). Ruta (*Ruta graveolens*) and caulis (*Brassica oleracea*) which were mentioned by Albertus (lib. i, § 155) as typical examples of *olera virentia*, were described by him later on as *herbae* (lib. vi, §§ 304, 428). The term *arbor* was also used in a general sense, including for example edera (*Hedera Helix*), which was a typical *rubus*.

The main stem and its branches and branchlets of various orders were *stipes*, *rami*, *virgae* and *flagra* respectively. The main stems of a bush (*frutex*) or caulescent herb (*olus virens*) were sometimes called *crura* instead of *stipites*. The branches of the root were known as *virgae*, doubtless on account of their length and slenderness. The term *radix* was applied not only to true roots, but to various underground stems such as the bulb of *Lilium candidum* and the corm of *Crocus sativus*.

The word *folium* denoted not only a simple leaf, but a leaflet of a compound leaf, and a segment of a dissected one. In relation to the inflorescence and flower, it was applied also to a bract, sepal or petal. Pinnate and pinnatisect leaves with a rhachis of different consistency from the leaflets—such as those of the walnut (*Juglans regia*), ash (*Fraxinus excelsior*), service tree (*Sorbus domestica*), liquorice (*Glycyrrhiza glabra*) and agrimony (*Agrimonia Eupatoria*)—were recognised as belonging to a special type, their rhachis being variously termed *ramus folialis*, *virgula parvula*, *stipes* or *linea longa*. The leaf of the elder (*Sambucus nigra*) was apparently not placed in this category, presumably on account of the softer and herbaceous nature of its rhachis.

The palmate arrangement of leaflets was described by Albertus in pentafilon (*Potentilla reptans*) :—" latine vocatur quinquefolia, eo quod quinque et quinque folia simul habet circa nodum unum." Here the term *nodus* was applied to the apex of the common petiole. In describing agnus castus (*Vitex Agnus-castus*), on the other hand, he gave no indication of the palmate arrangement of the leaflets.

A simple leaf, such as that of the hazel (*Corylus Avellana*) was said to arise directly from the wood:—" Corilus . . . habet folium immediate egrediens de suo ligno."

The pinnatifid leaves of oak (*Quercus Robur*) and henbane (*Hyoscyamus niger*) were said to be circumscribed by triangles :—" Et est totum circumpositum triangulis, quorum bases sunt super folium, et angulus est in exteriori." A palmatifid leaf with five lobes or more, as in the castor oil plant (*Ricinus communis*), was described as stellate :—" folia eius sunt maxima et rotunda ad modum stellae emittentis radios." The 3-5-lobed leaves of the hop (*Humulus Lupulus*) were distinguished from those of the vine (*Vitis vinifera*) by being circumscribed by triangles :—" sed sunt triangulis circumposita." The 3-lobed palmatifid leaves of the vine, the fig and the sycamore (*Acer Pseudoplatanus*) were described as broad and divided into three :—" Est autem frondosa vitis, et est suum folium latum, in tria divisum, sicut folia ficus et platani."

Much dissected leaves were apparently regarded as branchlets bearing many leaves :—" Fumus terrae [*Fumaria officinalis*] est herba viridis parvorum valde foliorum." Narrow segments were known as *fila* (as in *Foeniculum officinale* and *Matricaria Chamomilla*), *costae* (in *Anthemis Cotula* and *Matricaria Chamomilla*) or *lineae* (in *Foeniculum officinale* and *Pimpinella Anisum*). Occasionally, however, the whole leaf seems to have been loosely termed a *folium*, as in *Artemisia vulgaris*, where the leaf was described as divided into many parts :—" Artemesia herba est nota et usitata, habens aliquantulum folia divisa in multa." In the description of anisum (*Pimpinella Anisum*) the term *folium* seems to denote an individual segment of the leaf :—" Habet autem folia sicut feniculum per lineas divaricata, nisi quod sunt parum latiora quam folia feniculi." So also in feniculum (*Foeniculum officinale*) :—" Feniculum est herba habens multum divaricata folia, sicut si sint quaedam fila." Here *folium* was equivalent to *filum*.

A denticulate or crispate margin was said to have many angles :—" Laurus [*Laurus nobilis*] arbor est . . . habens folia . . . habentia multos angulos in circuitu." The undulate margin of the leaf in daxus (*Ilex Aquifolium*) was described as much curved :—" Quaedam autem arbores in foliis habent multas spinas, sicut arbor, quae vocatur daxus . . . Cum autem de foliis exspirat spina, contrahit folium et incurvatur ; et ideo multa curvitas est in foliis eiusdem arboris."

The petiole of a leaf was termed *crus* or *cotyledo* : " Quaedam [species betae] enim est viridis in cruribus foliorum suorum, et quaedam rubea " (485, vi, 292*) : " Circumferentia [laminae] deficit ad cotyledonem folii " (534, vi, 378). Tendrils were known as *anchae*, e.g., in *Vitis*, *Cucurbita* and *Cucumis*.

The existence of two different kind of spines—deep seated and superficial—was clearly recognized by Albertus :—" Inveniuntur autem duo genera spinarum in plantis. Sunt enim spinae, quae ex profundo plantae educuntur ; et hae quidem rectae et longae sunt propter calorem materie. Sunt etiam quaedam spinae, quarum basis non profundatur in corpus plantae, sed stat super corticem, quasi extrinsecus adhaerens plantae; et sunt istae spinae breves, recurvae anterius, et peracutae, sicut sunt spinae tribulorum et bedegar et rosariorum et ramni." The plants mentioned as having superficial spines are species of *Rosa* and *Rubus*.

---

*The three figures cited indicate respectively the page, book and section of Albertus, De Vegetabilibus.

The vascular bundles (*viae nutrimenti* or *viae venales*) were observed by Albertus, who mentions that they may be seen as threads when a leaf of plantain (*Plantago*) is slowly plucked. The bark (*cortex*) was noted by him as consisting, in large plants, of two layers, the outer one hard and dry, and the inner one softer and sappier. Wood and pith were *lignum* and *medulla* respectively. Medullary rays when conspicuous, as in the vine, were taken by him for *viae venales*.

The annual rings of Dicotyledons and Conifers were *tunicae ligneae*. The wood of the date-palm (*Phoenix dactylifera*), on the other hand, was peculiar in being composed of stakes (*asseres*) :— "Habet autem palma lignum—sicut dictum est—valde rarum et quasi ex asseribus compositum, et non ex circularibus tunicis crescens, et ideo etiam est angulosum."

The inflorescence was in some cases recognized by Albertus as a group of flowers, but in others was regarded by him as a single flower. Spikes of grasses and spike-like inflorescences of *Labiatae* were denoted by the term *spica*; and the panicle of milium (*Panicum miliaceum*) was termed *spica divaricata*. The thyrse of *Vitis* was *botrus*. Capitula, umbels, and umbel-like or corymbose inflorescences of small flowers were regarded as single flowers :—" Sambucus . . . florem autem habet ad modum coronae formatum."

Albertus defined the " flower " as a sign of the fruit :—" flores qui sunt indicia fructuum." To him the " flower " (*flos*) was the *coloured* part of a flower or inflorescence, and did not include *green* sepals or bracts. The fig and mulberry were mentioned as producing fruit without " flowers." Sometimes the term *flos* was restricted to the expanded and petal-like parts, as in camomilla (*Matricaria Chamomilla*), the " flower " of which was described as white, the yellow disk-flowers being ignored. Sometimes the filaments or stamens, distinguished as *spicae* or *lineae*, were apparently regarded as part of the flower, as in *Clematis Vitalba*. In *Vitis vinifera* the stamens were the " flower " itself :—" Flos eius est citrinus, habens parvulas quasdam emissiones linearum, quae in superiori habent nodulos quosdam." The red stigmas were the " flower " of the hazel :—" Avellanae tamen parvulum et rubeum habent florem." Some authors considered that the red mace (aril) of the nutmeg (*Myristica moschata*) was its flower :—" Macis est folium et flos, sive folium floris muscatae." " Flos eius a quibusdam macis esse dicitur." The yellow spadix was the flower of basilicus (*Arum*) :—" Florem autem habet croceum, et facit in semine multa grana, sicut botrus, et sunt primo viridia, et postea rufa, quando sunt matura." Among other inflorescences regarded as flowers were those of many Umbelliferae and Compositae, *Sambucus*, and *Origanum vulgare*.

Green parts enclosing the coloured "flower" were termed *folliculi*, *siliquae* or *thecae*. The "flower" (corolla) of the poppy (*Papaver*) was described as enclosed in a *siliqua* (calyx), and that of borage (*Borago officinalis*) in a *theca* (calyx). The spathe of *Arum* was termed *siliqua*, and so was the involucre of salsify (*Tragopogon porrifolius*). The three terms *folliculus*, *siliqua* and *theca* were in fact used, in the general sense of "envelope," for various members of different morphological nature.

A bract, if uncoloured and expanded, was simply termed *folium*, as in *Tilia*. A green calyx was *folliculus*, *siliqua* or *theca*. The corolla was generally *flos*. The filaments were *emissiones linearum* or *virgulae*, and the style was also a *virgula*. The filament, when considered in relation to its anther, was termed *cotyledo* (stalk). Both filaments and styles were sometimes called *spicae floris*.

The term *germen* may possibly have been used for the ovary in the case of cirpus (117, ii, 38), but its exact application in that passage is uncertain: elsewhere it was applied to a bud, plumule or embryo. Usually the ovary was not distinguished from the fruit, being regarded merely as an early stage of the latter:—" Papaver . . . profert ipsum [sc. florem] sub fructu suo in nodulo uno, qui est sub capite suo et profert eum in siliqua, qui aperitur ex parte cruris eius, et cadit flore aperto." Here the word *caput* denoted the ovary, and it was applied also to the capsule, as in Pliny: both were "heads."

Peduncles and pedicels were *cotyledones* (stalks), the former being sometimes termed *crura*, and the latter *pendiculi*. As mentioned above, the two terms *cotyledones* and *crura* were applied also to petioles, and *crura* also to stems of bushes and caulescent herbs.

Although Albertus restricted the term *flos* to the *coloured* leaves or parts of a flower or inflorescence, there are indications that he regarded the flower (in the modern botanical sense) as a distinct entity. Thus he described the flower of borage (*Borago officinalis*) as arranged like a star composed of five circles consisting of five parts each, namely, (1) *theca floris* (calyx), (2) *folia floris* (corolla-lobes) (3) *parvulae eminentiae in flore ipso* (corona-segments), (4) *quinque virgulae* (stamens), and (5) *una virgula* (style), nos. (4) and (5) collectively being termed *spicae floris*. Here the calyx to the outside, and the stamens and styles to the inside, were recognised as subsidiary parts of the flower (*flos*):—" Borago . . . habet . . . florem iacinctinum, ut stellam dispositum in quo est compositio quinque quinariorum. Quorum primus est exterior, qui fuit theca floris, et est viridis, secundus autem est iacinctinus, qui est folia floris, et postea sunt quinque parvulae eminentiae in flore ipso, et sunt quasi primae extremitates foliorum iacinctinae superius, et inferius albae; post illas ad intrinsecus floris sunt quinque virgulae iacinctinae longae et rectae ; et in medio illarum est una virgula longior eis, et illae sunt spicae floris."

Albertus observed that " flowers " (*folia floris*) without stamens (*lineae interiores, linearum emissio*) inside them were not found, but that stamens without "flowers" outside them occurred in the vine, and perhaps in the beet (*Beta vulgaris*) :—" Exteriora enim lata folia floris sine lineis interioribus non inveniuntur, sed linearum emissio invenitur sine exterioribus foliis floris, ut in vite in arbore, et forte in herba, quae dicitur blitus, ut quidam dicunt, quia hoc non sum ego expertus " (463, vi, 246) : " Est tamen non praetereundum hic, quod omnis fere flos cuiuscunque sit plantae, in medio sui huiusmodi habet granulorum congeriem per parvulos cotyledones fundo floris infixam " (156, ii, 133).

In the white lily (*Lilium candidum*) Albertus remarked the absence of a green *siliqua* (calyx) outside the " flower," and the presence of six filaments bearing anthers (*crocei nodi molles*) and a style with a stigma (*nodus sicut clavus*) :—" Nec est siliqua viridis et theca, in qua flos generatur, sicut in papavere : sed ipsa floris folia a viridi transeunt in album colorem ; et tunc flos aperitur ex parte anteriori. Flos autem habet folia sex, et in medio profert virgulam longam, quae habet nodum sicut clavus aut terminus ; et illa stat in medio lilii, et est crocea, et circa eam stant breviores quaedam et debiliores virgulae, omnes habentes croceos nodos molles, cum tamen folia lilii sint alba." He observed that, in every flower composed of several series [whorls] of leaves, each leaf of an exterior series covered the space between two leaves of the series next inside it, i.e., that successive floral whorls alternated with one another :—" Sub qualibet compaginatione duorum foliorum siliquae [sc. duorum sepalorum] subicitur recte medium dorsum unius folii rosae [sc. unius petali]. Et hic ordo observatur etiam in rosae foliis, quod semper dorsum interioris folii porrigitur directe ad rimam exteriorum duorum foliorum, et ad rimam interiorum foliorum obicitur dorsum folii exterioris ordinis. Et hoc habet rosa commune cum aliis floribus, quorum siliquae et flores ex multis ordinibus foliorum componuntur, sicut patet in flore boraginis et herbae, quae vocatur pes cornicis, et in multis aliis : et hoc facit natura ne humor aut aliud nocumentum exterius facile penetrare possit ad interius germinis. Si enim unum ordinem penetraverit, in alio inveniet resistentiam " (447, vi, 214, 215).

Albertus distinguished " flowers " (*flores*) of two kinds : those situated on top of the fruit, e.g., *Pyrus*, *Malus*, *Cucurbita*, *Punica* and *Rosa* ; and those beneath or round the fruit, e.g., *Prunus*, *Amygdalus* and *Papaver* (153, ii, 128 ; 155, ii, 130 ; 446, vi, 213). He observed that nectar was produced inside the flowers at the bottom, e.g., at the base of the corolla-tube of *Lamium* (150, ii, 121). Pollen (*formale croceum*) occurred in the flowers of *Papaver*, *Tilia* and *Betula* (mirica), and more or less in all flowers, and adhered to the hind legs of bees collecting honey (157, ii, 122).

The shapes of flowers included the "aviform," seen in aquilea [*Aquilegia*], which consisted of four [really five] eagle-like parts. The zygomorphic corollas of *Lamium* and *Viola* were mentioned as belonging to a similar type. The papilionaceous flower of *Melilotus* was described as "flos lunaris" (537, vi, 385). Campanulate flowers were seen in enula campana, and pyramidal (i.e., obconical or funnel-shaped) ones in ligustrum (*Calystegia sepium*). The commonest type of flower, however, was the stellate, typified by *Rosa*. Many flowers, e.g., those of *Lilium*, *Agrostemma* and *Punica* were intermediate between the campanulate and stellate type. The description of enula campana suggests *Digitalis purpurea* rather than *Inula Helenium*. It had leaves like those of comfrey (*Symphytum officinale*) and campanulate-funnel-shaped red flowers. Finally it possessed diuretic properties. These various details suggest *Digitalis* rather than *Inula*.

The persistence of the calyx for a time in *Rosa*, and on the ripe fruit in *Mespilus*, was noted by Albertus (447, vi, 215), and so was the persistence of the stamens round certain fruits (462, vi, 246).

Albertus paid particular attention to the morphology of fruits. Dry one-seeded fruits, such as achenes, cypselae and caryopses, were naturally regarded by him as seeds (*grana*), as in *Clematis Vitalba*, *Rosa*, *Compositae*, and cereal grasses. The pericarp of an achene or cypsela was termed *pellicula* and that of a caryopsis was *tela*. "Seed" in a collective sense was *semen*; and a "seed-vessel," whether dry or fleshy, was *vas seminis*, that designation being applied equally to the dry capsule of *Agrostemma Githago* and the fleshy pseudocarp of *Rosa*.

Nuts were *nuces*: these included walnuts, coconuts, hazel-nuts, chestnuts and acorns. The pericarp or endocarp, if hard and shell-like as in *Juglans*, *Cocos* and *Corylus*, was termed *testa*, and if softer and flexible, as in *Castanea* and *Quercus*, it was *casta*.

Dry dehiscent fruits were known generally as *siliquae*, a term applied to the capsules of *Papaver* and *Reseda*, and the legumes of *Cicer*, *Faba*, *Vigna*, *Pisum* and *Lens*. The legumes of *Lens* and *Vicia sativa* were mentioned also under the name *castae*.

Albertus had no special name for capsule: those of *Papaver* and *Agrostemma* he mentioned as *caput* and *vas seminis* respectively. That of *Viola* which had fewer and larger seeds he termed *folliculus*. Those of *Agrostemma Githago* and *Hyoscyamus niger* were also termed *thecae*, and so were the follicles of *Paeonia*. The three terms, *siliqua*, *folliculus* and *theca* were in fact used rather loosely in the sense of dry seed-vessels or pericarps. They were applied also to involucres, spathes and calyces, as mentioned above.

The designation *pomum* included not only true pomes, e.g., of *Pyrus*, *Malus* and *Cydonia* but other large and medium-sized fleshy fruits, such as those of *Citrus*, *Citrullus*, *Punica* and *Rosa*, and even woody fruits such as the cones of *Pinus* and *Cupressus*. The horned woody capsule of *Buxus* was described as *pomulum aculeatum superius*.

There were no special terms for drupes and berries as such, but the former were described as having flesh and bone, and the latter only flesh round the seed:—" Fructus . . . quidam componuntur ex carne et osse et grano, sicut pruna secundum omne genus suum ; quidam autem ex carne et grano, sicut cucumeres ; et quidam ex carne et osse, sicut dactili " (84, i, 177). Here the horny endosperm of the date was termed the bone (*os*) of the fruit.

Seeds generally were *semina* ; if relatively large they were termed *grana* ; occasionally, as in *Malus*, the whole seed was known as *nucleus*, but that term was generally restricted to the seed without its coat (kernel).

The seed-coat (testa of botanists) was termed *pellicula*, *pellis* or *tela* : the term *testa*, on the other hand, seems to have been reserved for hard pericarps or endocarps :—" Fructuum enim habent aliqui tres coopertuias—sicut nuces habent circa testam carnem quandam et testam et interiorem pellem, et amigdala similiter et persica et multa alia " (64, i, 128) : " Habet oliva etiam fructum, qui exteriorem corticem habet terrestrem ; et in ipso est caro pinguissima, quae dicitur adeps olivae, ex qua exprimitur oleum ; in cuius medio habet os durissimum, et in illo nucleum pellicula tenui involutum, sicut involvuntur alii nuclei nucum " (419, vi, 158).

The plumule, being the " sprout " of the embryo, was termed *germen* :—" Quaedam [semina] faciunt germen suum in summo farinae suae, sicut cicer faba et glandes nux et avellanae " (186, iii, 58). The cotyledons, if hypogeal or thick and fleshy, were not recognized as leaves, but as two parts into which the kernel was divided, as in *Laurus*, *Amygdalus* and *Quercus*. The radicle was of course the young root.

SUMMARY.

From a general survey of the morphological system of Albertus, it is evident that he laid the greatest stress on the function of the various parts of the plant, and that their consistency or texture came next in order of importance. Hence particular terms were applied by him rather to analogous organs than to homologous members.

Among the advances in plant morphology made by Albertus Magnus were the recognition of the existence in many flowers of several alternating whorls, as in *Borago officinalis* ; the observation that stamens occurred in almost all flowers, and the distinction of filament and anther (and of style and stigma in *Lilium candidum*) ; and the discrimination of the various layers of tissue found in fruits.

As regards vegetative characters he failed to appreciate the importance of the opposite, whorled or spiral arrangements of leaves, which had been indicated by Theophrastus. On the other hand he recognised the pinnate leaf of *Juglans*, *Fraxinus* and *Sorbus domestica* as representing a special type of leaf arrangement, though he apparently failed to observe that *Sambucus* also had leaves of that type. Theophrastus had suggested that the pinnate leaf of *Fraxinus* might be regarded as a single leaf, since it fell off as a whole: to Albertus, however, it was a special branch or axis bearing leaves.

Albertus noted that the infructescence (*botrus*) of the vine was borne opposite a leaf, and that a tendril was sometimes produced in its place, and he came to the conclusion that the tendrils were incomplete *botri*, modified for the purpose of supporting the plant—a remarkable instance of reasoning from homology.

He recognised that the stems of most plants grew by the formation of one layer outside another—" Tunc crescit planta quasi per quasdam tunicas herbales vel ligneas, quarum una superponitur alteri " (121, ii, 49)—and observed that the date palm was an exception (428, vi, 179). At the same time it seems going a little too far to assume that Albertus had in mind a classification in which the Monocotyledons (as " corticate plants ") were distinguished from the Dicotyledons and Gymnosperms (" tunicate plants "). His recognition of two kinds of spines, superficial and deep-seated, is dealt with above.

Albertus Magnus was an acute observer who recorded what he saw: to this is due his high position in the history of mediaeval botany.

LV—BOTANICAL TERMS IN ALBERTUS MAGNUS.*

T. A. SPRAGUE.

One of the principal difficulties encountered in reading mediaeval botanical works is the strange yet deceptively familiar terminology employed in them. Many botanical terms still current nowadays were then used in very different senses, and certain words possessed a more general signification, covering several morphological categories now recognized as distinct. The word *cotyledo* illustrates both difficulties: now the equivalent of cotyledon, in Albertus it meant a stalk of various kinds—petiole, peduncle, pedicel, filament or funicle. Other modern terms used by Albertus with different or additional meanings were: *arillus, arista, folliculus, legumen, nodus, pomum, racemus, siliqua, spica, stipula, testa, theca, virgula*. The word *siliqua*, now applied to the capsular fruit characteristic of *Cruciferae*, was used by Albertus to denote a spathe, glumes of a grass spikelet, a calyx, a dry seed-vessel or pericarp, and the cartilaginous " endocarp " of a pome. A further source of difficulty is the employment of two or three different words in practically the same sense: thus the three terms *folliculus, siliqua* and *theca* were used more or less indiscriminately with the general meaning of closed covering. Similarly *camera, casa* and *cellula* were equivalents of loculus.

---

*See Botanical terms in Pliny's Natural History (*K.B.* 1933, 30); Botanical terms in Isidorus (*K.B.* 1933, 401); Plant Morphology in Albertus Magnus (*K.B.* 1933, 431).

The gradual change of meaning of certain terms from the first through the seventh to the thirteenth century is illustrated by the word *arbustum.* This was used by Pliny in its classical sense of plantation of trees, on which vines were trained; by the time of Isidorus it had acquired the additional meaning of sapling; and in Albertus Magnus it meant shrub—the equivalent of the French word arbuste. Thick, as applied to leaves, was *spissus* (not *crassus*) in Albertus, and narrow was *strictus* (not *angustus*). *Reticulatio* denoted the reticulation of veins in a leaf—previous writers do not seem to have paid much attention to this character, and Albertus was possibly the first to use the word in this sense.

Caducous members whose function was not understood by Albertus were naturally considered by him as excreta: thus the male catkins of *Alnus*, *Corylus* and *Juglans* were called *purgamenta* or *superfluitates*. Similarly pollen (*formale croceum*) was regarded by Albertus as a secretion of bile (*cholera*).

GLOSSARY.

abstergere, to cleanse; *abstersio*, cleansing; *abstersivus*, having cleansing properties, abstersive:—"Hac autem virtute videtur etiam perfici operatio, quam in multis plantis invenimus, quod videlicet abstergunt et excoriant ea, quae tangunt. Abstergendo enim non tollerent humidum a superficie aliqua, nisi per siccum; nec excoriarent, nisi per siccum peracutum; sicut faciunt agnus castus et aristologia, quae tantae sunt abstersionis, quod etiam pellem evellunt ab his, quibus superponuntur" (335, v, 112).

abusivus, misapplied, improperly used (29, i, 51).

acetositas, acidity (195, iii, 79).

acetosus, (*sapor*), acid, cold and sharp (taste), e.g. of vinegar (197, iii, 83).

acuitas, sharpness (of spines) (333, v, 102).

aculeus, (1) prickle:—"Crocus est duorum modorum. Unus [*Carthamus tinctorius*] est olus altum habens aculeos et folia lata" (488, vi, 297): "Brachia eius [sc. *Humuli Lupuli*] sunt aculeata parvis ut lanugo aculeis, et sunt aspera in tactu, et sunt torta" (525, vi, 361); (2) adventitious root of ivy, *Hedera Helix*:—"Edera quidem repit super sibi vicina, sed hoc non facit anchis, sed potius quibusdam aculeis, per quos sugit" (459, vi, 238).

acutus (*sapor*), pungent, hot and biting (taste), e.g. of mustard (197, iii, 83).

adaequare, to level (600, vii, 27).

adaequatio (*terrae*), levelling (of the soil) (600, vii, 25).

adurere (lit. to set fire to, burn), to damage:—"Est autem papaver zizania avenae, et adurit eam et exsiccat trahendo nutrimentum eius a radice ipsius" (554, vi, 420).

ambragyon, shrub (vide *arbustum*).

amurca (class. lees or dregs of olive oil), stone (endocarp) of *Olea europaea* (419, vi, 159).

anca, ancha, tendril (458–9, vi, 236, 238).

ante fructum=*supra fructum*, above the fruit :—" Situs autem florum, ut superius diximus, aliquando est ante fructum, in principio fructus ex parte suprema ipsius ; et iste modus in omnibus notis apud nos invenitur piris et malis et malis granatis " (153, ii, 128).

anterior, distal :—" Et est quoddam papaver marinum, cornutum, cuius anterior pars est sicut cornua tauri " (554, vi, 420).

apertio, lit. opening, e.g. of cones (366, vi, 60) ; *apertio terrae*, breaking up the soil (600, vii, 25).

arbor, tree :—" Arbor enim est, quae habet ex sua radice stipitem fortem, super quem nascuntur rami plures, et in ramis virgae plurimae, et in virgis ea, quae vocantur flagra plurima, sicut oliva et cypressus et fici sive ficulneae " (75, i, 153).

arbustum, shrub :—" Plantae autem, quae sunt mediae inter arbores et herbas, quae dicuntur ambragyon graece, et latine arbusta, habent emissos a radicibus suis multos ramos per modum palmitum. Et sunt trium generum, quoniam quiddam est sicut id, quod graece dicitur magnus, et aliud est sicut cannae arundinum magnarum, et tertium est sicut frutex " (75, i, 154) : " Arbusta enim sunt quasi busta arborum dicta, quae siccitate terrestri et forti calore adurente ad perfectionem arborum non perveniunt, licet figuras arborum habere videantur " (111, ii, 22).

area, *areola*, garden bed :—" Areae autem in hortis angustae faciendae sunt et longae et altae, ut multum virtutis in se areola retineat " (643, vii, 136).

arillus, seed of a grape :—" Arilli pro certo sunt semina vitium " (76, i, 148) : " Quaedam grana seminaria, quae sunt in uva et vocantur arilli " (460, vi, 239).

arista, ear of corn :—" Stipes plantae in frugibus . . . ab illo [sc. nodo tertio] usque ad aristam sive ad culmum subtiliatur valde et acuitur " (118, ii, 40) : " Granum eius [sc. frumenti] est in circuito calami, qui multum subtiliatur in medio aristae, ubi sunt grana " (519, vi, 349).

asper, (1) rough :—" Quercus autem est arbor magna . . . multum asperi corticis, quando antiquatur, sed laevem habet in iuventute " (440, vi, 203) ; (2) prickly, e.g. the leaves of *Ilex Aquifolium* and *Rosa rubiginosa* :—" Daxus habet asperum folium valde, et similiter bedegar " (82, i, 168) : " Quaedam autem arbores in foliis habent multas spinas, sicut arbor quae vocatur daxus " (266, iv, 115).

azulinus, *azurinus*, blue, lilac, violet, purple (478, vi, 275 ; 484, vi, 289 ; 575, vi, 464 ; 579, vi, 471).

balaustia, flower of the pomegranate :—" Granatum habet florem rubeum sicut rosa, et ille vocatur balaustia " (397, vi, 118).

barbulae (lit. little beards), laciniae of the foliar sheath of *Equisetum* (505, vi, 325).

bladum, corn (261, iv, 101 ; 544, vi, 399).

botrus, bunch of grapes (459, vi, 239).

brachium (lit. arm), long branch, e.g. of *Humulus Lupulus* (525, vi, 361).

bucca (lit. the cheek, hence mouth), depression at the apex of a fruit, e.g. of an apple (403, vi, 129).

caespes, greensward, turf (636, vii, 120–124).

calamus, culm of a cereal (117, ii, 40 ; 518, vi, 348).

camera, loculus :—" Siliqua interius est dura per quinque . . . cameras divisa, et in qualibet camera grana aliquot seminum continens " (166, iii, 7).

canna, cane, bamboo, hollow reed-like stem :—" Cannae arundinum magnarum " (76, i, 154) : " Haec [*Ricinus communis*] enim cannam habet pro stipite " (347, vi, 20).

capsa (lit. box, case), (1) outer covering of the terminal bud of the date-palm (429, vi, 179) ; (2) spathe of a date-palm (427, vi, 177) ; (3) locellate fruit of *Cassia Fistula* (375, vi, 75).

caput (lit. head), (1) bulb of *Allium* (549, vi, 409) ; (2) ovary and capsule of *Papaver* (554, vi, 419).

caro (lit. flesh), (1) tissue of a plant, whether woody or herbaceous :—" Caro, lignea vel herbalis, plantarum " (74, i, 149) ; (2) wood :—" Interior autem color carnis plantarum albus et croceus est, sicut in carne cedri et brisilii, et aliquando quasi glaucus, sicut in ligno aloës, et aliquando niger, sicut in ebeno nigra " (134, ii, 79) ; (3) flesh of a berry or drupe :—" Ex componentibus autem diversificantur fructus, quoniam quidam componuntur ex carne et osse et grano, sicut pruna secundum omne genus suum, quidam autem ex carne et grano, sicut cucumeres ; et quidam ex carne et osse, sicut dactili " (84, i, 177).

casa (lit. house, cabin), loculus of a fruit (403, vi, 129).

casta, (1) pericarp of a nut, e.g. of *Quercus* and *Castanea* :—" In quibusdam [fructibus cooperculum] autem vocatur casta, ut in glande et castanea " (85, i, 177) ; (2) pericarp of a legume, e.g. of *Lens*, *Vicia*, *Pisum* and *Cicer* (531, vi, 372 ; 579, vi, 472).

casus, fall, shedding of leaves, flowers and fruits :—" Hae enim sunt causae casus foliorum et florum et fructuum " (67, i, 133).

caulis, cabbage, *Brassica oleracea* (493, vi, 304).

cellula, (1) loculus of a fruit (367, vi, 61) ; (2) compartment formed by the fleshy covering of a seed (367, vi, 61).

citrinitas, a greenish yellow colour (299, v, 24 ; 501, vi, 314).

citrinus, greenish yellow, lemon yellow, pale yellow :—" Dicunt autem quidam, quod vitis non facit florem, sed quod adhaeret ei, est pulvis citrinus " (462, vi, 246) : " Flos eius est citrinus " (493, vi, 303) : " In medio autem dorso folii . . . est vena citrina declinans ad albedinem " (521, vi, 352).

concavus, (1) hollow, fistular, e.g. stems of *Umbelliferae* (476, vi, 272) ; (2) concave :—" Concavus enim invenitur omnis flos notus apud nos " (159, ii, 140).

convalescere (lit. to recover, regain strength), to grow, establish itself :—" Sunt autem quaedam plantae humidae aquaticae molles, et illae, quocunque modo infigantur terrae, de facili radices emittunt et convalescunt " (120, ii, 48) : " Pullulat [oliva] autem etiam a nucleo suae amurcae. Sed melius convalescit a ramis infixis in terram vel insitis " (419, vi, 159).

cooperculum (lit. cover), pericarp, seed vessel (85, i, 177).

coopertorium (lit. cover), (1) cone-scale of *Cupressus* and *Pinus* (365, vi, 58, 60) ; (2) pericarp of *Punica* (366, vi, 60).

coopertura, covering, e.g. (1) leaves :—" Habent . . . perfectiores plantae . . . folia in coopertturam fructuum " (61, i, 124) ; (2) calyx (151, ii, 124) ; (3) flesh and stone of a drupe, and seed-coat :—" Fructuum enim habent aliqui tres coopertturas :—sicut nuces habent circa testam carnem quandam et testam et interiorem pellem, et amigdala similiter et persica et multa alia " (64, i, 128).

corona, lit. a garland, crown, applied to a flat-topped inflorescence or infructescence, e.g. of *Origanum* and *Sambucus nigra* :—" Origganum . . . granum suum profert in modum coronae " (544, vi, 398) : " Sambucus . . . florem autem habet ad modum coronae formatum " (450, vi, 220).

coronalis, like a crown, e.g. the inflorescence of *Daucus* :—" Daucus . . . habet florem album coronalem " (506, vi, 328).

coronaliter, arranged like a crown, e.g. the flat-topped infructescences of *Umbelliferae* and *Sambucus* :—" Feniculum habet florem croceum, et coronaliter disponit fructum sicut anetum et sambucus " (517, vi, 346).

cortex, (1) bark :—" Cortex autem duplex est in plantis magnis, exterior scilicet durior, et interior mollior et succosior " (59, i, 116) ; (2) hard outer layers of a sedge or rush stem (503, vi, 320) ; (3) skin of a drupe :—" Fructus olivae . . . habet corticem et carnem et testam durissimam et nucleum, qui est semen eius " (64, i, 128) ; (4) skin of a berry, e.g. of *Phoenix* (427, vi, 176) ; (5) pericarp of a seed-like fruit (172, iii, 19) ; (6) testa of a seed :—" Cortex seminis " (64, i, 128) : " Quarta substantia est corticis nucleorum " (403, vi, 129).

costa, lit. a rib, applied to : (1) rhachis of a pinnate or pinnatisect leaf, e.g. of *Juglans*, *Fraxinus*, *Agrimonia* (482, vi, 283) ; (2) capillary leaf-segment of *Matricaria Chamomilla* (486, vi, 294) and *Conium maculatum* (502, vi, 317).

cotyledo, a stalk : (1) petiole (493, vi, 304 ; 534, vi, 378) ; (2) peduncle of a flower or fruit (140, ii, 93 ; 152, ii, 124) ; (3) pedicel of a flower (530, vi, 370) ; (4) filament of a stamen (155, ii, 132) ; (5) funicle of a seed (513, vi, 337).

croceitas, yellowness (181, iii, 41 ; 553, vi, 418).

croceus, lit. saffron-coloured, but used in the general sense of yellow (160, ii, 141 ; 488, vi, 297).

crus, lit. leg, hence stalk : (1) *crura*, stems, e.g. of *Rubus* (444, vi, 210), *Cucurbita* and *Cucumis* (500, 501, vi, 312, 314 ; (2) *crura*, stems arising from a common root :—" Altea habet folia sicut malva, sed est maior ea, habens crura longa plurima ex radice una " (483, vi, 285) ; (3) main stem :—" Crus sive truncus " (493, vi, 304) : " Stipes sive crus eius est quadratum " (497, vi, 309) : " Crus longum altitudine duorum cubitorum" (530, vi, 370); (4) branch:—"Incipit crura sive ramos emittere" (421, vi, 163); (5) petiole:—"Quaedam [beta] enim est viridis in cruribus foliorum suorum, et quaedam rubea, et haec est maior et melior" (485, vi, 292); (6) peduncle:—"Habet autem [papaver] folium latum, et crus longum, in quo sunt capita sua . . . et profert [florem] in siliqua quae aperitur ex parte cruris eius" (554, vi, 419).

culmus, lit. a straw, culm of a grass:—(1) peduncle:—"Et videtur omnium nucum esse proprium, quod multae simul pullulant in culmo uno: sed plurimae sunt in culmo magnae nucis" [sc. *Juglandis regiae*] (415, vi, 150): "Aliae autem plantae sine siliqua in simplici pellicula grani, nuda proferunt grana, in culmis infixa, sicut carduorum genera" (167, iii, 9); (2) rhachis of inflorescence, e.g. of *Ricinus*:—"Fructus autem eius multorum est granorum in culmo uno, et est longus culmus ille sicut botrus" (348, vi, 20); (3) spike, e.g. of *Dipsacus* and cereals:—"Magnus culmus spinarum longarum ante recurvarum" (577, vi, 466): "Ordei et avenae culmi" (640, vii, 128); (4) stylar column of *Rosa arvensis*:—"In medio autem eius est respersio crocea, stans in culmo uno simul" (445, vi, 213).

cyphus=*scyphus* (60, i, 120).

dentes, lit. teeth, applied to the bulbils of *Allium* (482, vi, 284).

diffusus, spread out:—"Quarundam [folia] sunt diffusa valde, sicut vitis et platani, et arboris quae vocatur arbor paradisi, cuius folium habet latitudinem quasi cubitalem" (82, i, 168).

divaricare, to spread out:—"Porrum [*Allium Pŏrrum*] . . . habet caput, ex quo divaricat radices" (549, vi, 409).

divaricatus, spreading, divaricate or diverging, applied to the final segments of much dissected leaves of *Umbelliferae*, *Compositae* and *Cruciferae*:—"Anisum [*Pimpinella Anisum*] . . . habet autem folia sicut feniculum per lineas divaricata" (476, vi, 272): "Feniculum est herba habens multum divaricata folia, sicut si sint quaedam fila" (517, vi, 346): "Nasturcium [*Lepidium sativum*] habet folia divaricata" (541, vi, 393): "Abrotanum [*Artemisia Abrotanum*] est herba divaricata" (480, vi, 280); and to roots of *Allium*:—"Allium . . . radicem autem habet divaricatam sicut porrum" (482, vi, 284).

domesticus, (1) cultivated (79, i, 163; 267, iv, 117), hence interior, nearer (proximal), or adaxial; (2) adaxial (side):—"Stipites foliorum betae et caulis hanc [trigonam] figuram habent. . . . Tertius arcus, qui est ad domesticum plantae, concavum habet in exteriori superficie" (131, ii, 71, 72); (3) nearer:—"Radios illos abbreviat versus domesticum cotyledonis" (348, vi, 20): "Maius folium in extremitate insertum super folium minus versus domesticum folii" (364, vi, 55); (4) interior:—"Ista . . . disponuntur in interiori huius carnis—hoc est ex parte domestica ipsius" (362, vi, 52).

emissiones linearum, filaments (462, vi, 246).

expansus super terram, more or less spreading (patent or patulous), e.g. the leaves of *Symphytum officinale* :—" Folia . . . expansa sunt super terram, sicut folia consolidae maioris " (509, vi, 332)—opposed to erect :—" Raphanus [*Armoracia lapathifolia*] . . . est radix maior et longior ea, quae communiter radix vocatur [*Raphanus sativus*], erecta, non expansa super terram " (557, vi, 425).

experimentum, experience, observation (340, vi, 1).

falsarius, adulterator :—" Semen [juniperi] . . . in figura et colore est sicut cubebae, sed est amarum valde ; et ideo etiam falsarii deceptores permiscent eam cum cubebis " (399, vi, 122).

farina, (1) flour (150, ii, 122) ; (2) food material of seed—whether endosperm or embryo :—" Semina omnia ex duobus corporibus constituuntur, quorum unum est terrestre, et est cortex seminis, et alterum est farina ipsius seminis " (64, i, 128) : " Substantia nucleorum, quae vocatur farina nuclei " (403, vi, 129).

farinalis, having the nature of flour (441, vi, 204).

fila (lit. threads), (1) narrow segments of a dissected leaf (486, vi, 294) ; (2) the dried stigmas of the saffron crocus (489, vi, 297).

fissura (lit. cleft), line of dehiscence, ventral suture of a legume :—" Producit etiam haec herba [*Faba vulgaris*] siliquam longam, in qua secundum ordinem sunt multa semina, sugentia ab ipsa per cotyledonem iuxta fissuram siliquae " (513, vi, 337).

flagrum, ultimate branchlet or shoot, shoot used as a scion in grafting :—" Nascuntur . . . in ramis virgae plurimae, et in virgis ea, quae vocantur flagra plurima " (75, i, 153) : " Inserentes quaerunt parva flagra recentia " (623, vii, 82).

flagrum aquaticum, water shoot (61, i, 124).

flos, coloured part of the flower or inflorescence : (1) corolla :—" In folliculis autem et siliquis flores formantur propter teneritudinem ipsorum ; aliter enim frequenter laederentur frigore " (151, ii, 124) : " Et viridis quidem nunquam inventus in aliquo flore " (160, ii, 141) ; (2) stamens :—" Flos eius [sc. *Vitis*] est citrinus, habens parvulas quasdam emissiones linearum qui in superiore habent nodulos quosdam " (462, vi, 246) ; (3) red stigmas of *Corylus Avellana* (153, ii, 127) ; (4) red aril of *Myristica moschata* (404, vi, 130) ; (5) inflorescence :—" Sambucus . . . florem autem habet ad modum coronae formatum " (450, vi, 220) ; (6) spadix of *Arum* (485, vi, 290).

folium, (1) foliage-leaf :—" Borago habet folia aspera " (485, vi, 291) ; (2) leaflet :—" Fraxinus . . . folia multa producit ex uno stipite sive ramo foliali " (391, vi, 108) : " Folia autem eius [sc. *Juglandis regiae*] sunt magna, et plura eorum oriuntur ex una linea longa ex arbore egrediente, et in hoc convenit cum fraxino et liquiricia " (414, vi, 147) ; (3) segment of a dissected leaf :—" Feniculum est herba habens multum divaricata folia sicut si sint quaedam fila " (517, vi, 346) ; (4) sepal :—" Siliquae [florum rosae] . . . compositae ex quinque foliis " (446, vi, 214) ; (5) petal :—" Rosa multorum foliorum, quando est hortensis " (445, vi, 213).

folliculus, closed covering: (1) covering of bud-scales:—"Plantarum autem, quae longe folium distans habent a radice, quarum sunt lignea corpora, in folliculo cooperta producunt folia" (142, ii, 101); (2) calyx:—"In folliculis autem et siliquis flores formantur propter teneritudinem ipsorum" (151, ii, 124); (3) capsule:—"Hoc cooperculum . . . in quibusdam vocatur folliculus, sicut in viola" (85, i, 177).

formale, substance, material, e.g. *formale croceum*, pollen:—"Videtur autem huiusmodi formale croceum maxime in floribus papaveris et tiliae et miricae; est autem secundum plus et minus in omnibus, et adhaeret posterioribus cruribus apum, quando mella colligunt" (151, ii, 122).

fructus, fruit, in a general sense, including drupes, berries, legumes, capsules, caryopses, nuts (84, i, 177).—Albertus considered that a fruit was absent in certain plants, e.g. *Salix* and *Agrimonia*. He regarded the pseudocarp of *Agrimonia* as a seed (482, vi, 283), and stated that *Salix* produced no fruit in Germany, unless the down which separates from it towards the autumn be regarded as such (449, vi, 218).

fruges, cereal grasses, corn:—"Frumentum et ordeum et cetera grana frugum" (642, vii, 134).

frumentum, wheat (518, vi, 348).

frutex, bush:—"Vocamus enim frutices ea, quae multos ex una radice ramos emittunt, cum tamen sunt lignei rami, sicut sunt spineta quaedam" (76, i, 154): "Frutex est, quando palmites multi egrediuntur de radice una, et illi sunt et similes et aequales" (70, i, 139).

frutex magnus, arborescent shrub:—"Fere autem omnis planta sub his cadit nominibus [arbores, arbusta, herbae]. Fere autem dico propter fruticem magnum, qui medius inter arbustum et arborem esse videtur, plus tamen ad arborem declinans" (75, i, 151).

fusticulus, lit. small piece of wood, applied to the cone-scale of *Cupressus* and *Pinus* (365, vi, 57).

gemma, bud:—"Quaedam autem producunt ea [sc. folia] ex suis gemmis; et hoc est commune fere omnibus arboribus quae gemmas habent, ex quibus et folia formantur et flores, praeter eas, quae nuces ferunt" (98, i, 199).

germen, lit. sprout, bud; hence: (1) sprouting from a bulb or seed:—"In ipsa [cepa, i.e. bulb of *Allium Cepa*] est maior virtus germinis eius post semen eius" (487, vi, 295); (2) sprouting from a corm:—"Alius [*Crocus sativus*] est hortensis qui habet radicem dentatum sicut lilium, et in illa est virtus germinis eius" (488, vi, 297); (3) sprouting from a rhizome:—"Germen suum magis habet in radice quam in semine" (582, vi, 478); (4) plumule:—"Quaedam [semina] faciunt germen suum in summo farinae suae, sicut cicer faba et glandes nux et avellanae, et muscatae sicut dicitur sunt eiusdem naturae. Quaedam autem germen producunt ex infimo farinae suae, sicut grana tritici et ordei et avenae, quaedam autem faciunt in circuitu suae farinae sicut oliva et allium " (186, iii, 58 ; cf. etiam 260, iv, 99) ; (5) embryo :—" Sexta est substantia germinis, quae est interius immixta ossi dactili " (427, vi, 176) ; (6) ovary (?) :—" Eius germen quasi nullum esse videtur, nisi lanugo quaedam ad modum rarae stupae apparens in summitate ipsius " (117, ii, 38) : " Germen et semen " (117, ii, 37).

germinare, to sprout, shoot forth :—" Virtus germinandi in vite est in radice et stipite et flagellis eius et in arillis, sed maxime in ramis flagellorum, quia ex arillis aut nihil nascitur, aut, quod egreditur, vix convalescit in fortem vitem " (461, vi, 244).

germinatio, sprouting of seedlings, leaf-buds, flower-buds ; growth of an ovary into a fruit (257, iv, cap. ii).

glans, acorn :—" Fructus autem eius [sc. quercus] glans vocatur . . . Glans autem habet extra se siliquam duram, in qua continetur, quae quasi lignea est " (440, vi, 204).

gramen, grass or grass-like plant, especially in pastures and lawns (631, vii, cap xii ; 636, vii, cap. xiv) ; *gramina aspera,* sedges (631, vii, 105).

granulum (lit. a small grain), anther :—" Omnis fere flos, cuiuscunque sit plantae, in medio sui huiusmodi habet granulorum congeriem per parvulos cotyledones fundo floris infixam " (156, ii, 133).

granum, (1) grain (caryopsis) of a cereal grass :—" Illud genus plantae [sc. frugum] habet grana solida multae farinae " (117, ii, 40) ; (2) a cereal grass :—" Frumentum est de genere granorum " (518, vi, 348) : " Ordeum est granum, cuius herba est calamus cum nodis, sicut et alii calami " (544, vi, 399) ; (3) achenial fruit (cypsela) of *Compositae* and *Dipsacaceae* :—" Aliae autem plantae sine siliqua, in simplici pellicula grani, nuda proferunt grana, in culmis infixa, sicut carduorum genera " (167, iii, 9) : " Post florem in ipsis fit semen eius, quod est granum, aliquantulum oblongum " (577, vi, 466) ; (4) achene of *Clematis Vitalba* (462, vi, 245) ; (5) nutlets of *Labiatae* (508, vi, 330) ; (6) fruit of *Tilia* (456, vi, 233) ; (7) pseudocarp of *Agrimonia Eupatoria* (482, vi, 283) ; (8) a relatively large seed, e.g. of *Leguminosae, Pyrus, Punica, Prunus, Paeonia, Cucumis, Vitis* (85, i, 177 ; 166, iii, 7 ; 171, iii, 17 ; 172, iii, 18 ; 552, vi, 414).

herba, herb with radical leaves :—" Herba autem infimum locum plantae retinere videtur, quae sunt id, quod ex una radice non profert nisi folia, sicut rapa porri et quaedam alia " (77, i, 156) : " Quaedam enim, quae videntur esse in genere herbarum, ad duas declinant extremitates, sicut olus, quod vocatur olus regis, hoc enim est et herba et olus, et similiter acelga, et multa alia, quae primo sunt herbae, et postea sunt olus, sicut sinapis et coriandrum et petrosilinum si usque ad secundum steterint annum, et multa alia " (78, i, 159) : " Quoniam quidem herba non statim producit stipites . . . . Deinde vero . . . exsurgit in stipitem, et tunc planta, quae vocatur herba, rationem accipit oleris " (295, v, 14).

herbalis, herbaceous (opp. to ligneous) :—" Caro lignea vel herbalis plantarum " (74, i, 149).

hortensis, cultivated in a garden or orchard (opp. to wild) :— " Ex ista autem foliorum et fructuum diversitate cognoscuntur masculae plantae a feminis tam in hortensibus quam in silvestribus plantis; secundum proprietates competentes masculino et feminino" (100, i, 203).

hortensis sive *hortulanus ager*, kitchen-garden (643, vii, tract. 2, cap. ix).

hortus, garden in general, especially kitchen-garden (643, vii, 136).

iacinctinus, blue (in a wide sense) :—" Quinque [colores] communius in floribus videntur; albus videlicet et croceus et rubeus et iacinctinus et purpureus " (160, ii, 141).—Used of the corollas of *Borago officinalis* (485, vi, 291) and *Cichorium Intybus* (504, vi, 321), and the perianths of *Iris germanica* (522, vi, 355) and *Orchis mascula* (571, vi, 454).

insitio, grafting (89, i, 183 ; 622, vii, cap. x).

lac (lit. milk), latex :—" Humor vero magnarum arborum . . . in quibusdam est, sicut lac, spissus et albus et viscosus et digestus dulcis, sicut in ficulneis " (69, i, 138) : " Ficus enim lac habet et esula, secundum omnes species suas, similiter autem et illud genus endiviae, quod vocatur rostrum porcinum et multa alia genera plantarum " (280, iv, 145).

lanugo (lit. woolly substance, down), (1) *lanugo* sive *capillaritas* (*arborum*), epiphytic mosses, lichens and algae (298, v, 22) ; (2) plumose indumentum on the accrescent style of *Clematis* (462, vi, 245) ; (3) down-like tuft of stamens in cereal grasses and *Reseda Luteola* :—" Aliquando autem velut lanugo quaedam crocea dependet ex loco fructus, sicut in multis, quae sunt de genere granorum, sicut in frumento et siligine et huiusmodi " (154, ii, 128) : " In granis autem flos a loco formandi grani dependet quasi lanugo, exspirans de illa materia humoris, ex quo generari debet granum " (155, ii, 131) : " Flos autem eius est sicut lanugo quaedam tritici aut siliginis " (521, vi, 352) ; (4) down on the seeds of *Nerium Oleander* (423, vi, 165).

legumen, pulse, leguminous plant with edible seeds, e.g. *Cicer*, *Faba*, *Dolichos*, *Pisum*, *Lens*, *Vicia* (167, iii, 8 ; 470, vi, 299).

liber, outer bark of *Betula* :—" Cuius cortex exterior ex viscosa et lucida fit humiditate; et ideo albus est, et liber proprie vocatur" (390, vi, 107).

ligna (pl.), woody cone-scales of *Pinus* (432, vi, 186).

linea, (lit. line) filament :—" Flos eius est citrinus, habens parvulas quasdam emissiones linearum, quae in superiori habent nodulos quosdam " (462, vi, 246).

linea lignea, woody central axis of cone of *Pinus* (432, vi, 186).

linea longa ex arbore egrediens, rhachis of the pinnate leaf of *Juglans* (414, vi, 147).

luxuriare, to grow rankly or luxuriantly (592, vii, 6).

malleolus (lit. small hammer), node :—" Nodos autem voco juncturarum colligatio, sicut sunt nodi in vitibus ; et hi nodi malleoli vocantur " (57, i, 113).

malum, apple, fruit of *Pyrus Malus* :—" Pomum autem ipsum, quod malum vocatur, constat ex quinque substantiis " (402, vi, 129).

malum granatum sive *punicum*, pomegranate, fruit and tree of *Punica Granatum* (90, i, 185).

masculinus, masculus, male :—" Et invenimus in plantis, quae dicuntur masculinae, quia omne quod generatur ex eis, est durius et asperius ; et quicquid generatur ex his, quae dicuntur feminae, est mollius et lenius. Et est magis fructifera femina, et grossiores habet fructus propter abundantiam humoris " (24, i, 41) : " Cognoscuntur masculae plantae a feminis tam in hortensibus quam in silvestribus plantis, secundum proprietates competentes masculino et feminino. Masculus enim propter siccitatem durior, et propter caliditatem ramosior . . . et fructus est brevior et rotundior quam feminae " (100, i, 203).

medulla, pith :—" Quaedam arbores habent nodos et venas et ventres et lignum et corticem et medullam interius " (57, i, 112) : " Cirpus est iuncus in locis palustribus crescens. . . . Est autem cortex eius valde viridis, et plenus medulla " (503, vi, 320).

morum, (1) fruit of *Morus*, mulberry ; (2) fruit of *Rubus*, blackberry (411, vi, 143).

murra, burr on tree-trunks :—" Tertius autem modus nodorum est nascentiae quaedam, quae ebulliunt extra in arboribus, et convertuntur in lignum totum reticulatum . . . et hic nodus vocatur latine murra " (60, i, 120).

nodulus (lit. little knob, nodule), (1) tuber of *Orchis mascula* (571, vi, 454) ; (2) anther of *Vitis vinifera* (462, vi, 246).

nodus (lit. a knot), (1) node :—" Nodos autem voco juncturarum colligationem, sicut sunt nodi in vitibus " (57, i, 113) : " Centinodia . . . crura habet composita ex infinitis nodis " (504, vi, 322) ; (2) knot in wood :—" Cum nutrimentum sit terrestre et grossum, ubique claudit sibi viam rectam per venas ligni, et ideo divertit ad alteram partem, et ibi conglobatur in nodum " (60, i, 119) ; (3) burr outside tree-trunk :—" Ebulliunt extra in arboribus, et convertuntur in lignum totum reticulatum . . . et hic nodus vocatur latine murra " (60, i, 120) ; (4) knot-like end of a petiole of a palmate leaf :—" Latine vocatur quinquefolia, eo quod quinque et quinque folia simul habet circa nodum unum " (555, vi, 421) ; (5) globose bur (capitulum) of *Arctium* (534, vi, 376); (6) subglobose capsule of *Linum usitatissimum* (563, vi, 435) ; (7) anther of *Lilium candidum* (530, vi, 370) ; (8) stigma of *Lilium candidum* (l.c.).

nucleatus, kernel-like :—" Grana nucleata in cypresso " (365, vi, 58).

nucleus (lit. kernel), (1) seed without its coat :—" Olea . . . enim habet corticem et carnem et testam durissimam et nucleum, qui est semen eius, qui et ipsa habet pellem extra in testa circa se in qua involvitur " (64, i, 128) ; (2) seed with its coat :—" Distinguitur haec per quinque cameras, et in qualibet illarum formantur nuclei plures " (402, vi, 129) ; (3) soft nut, e.g. of *Castanea* and *Fagus* :—" Sunt in una theca multi nuclei tam in fago quam in castanea " (360, vi, 47).

nucum arbor, walnut tree, *Juglans regia* (74, i, 150).

nux (lit. a nut), (1) nut in general, i.e. a fruit with the kernel (*nucleus*) enclosed in a hard shell (*testa*) :—" Omnis fructus arboris, habens in se os, et in osse nucleum, vocatur nux, large sumendo " (416, vi, 153) : " Corilus enim, quae est arbor nota, habet nuces quae avellanae dicuntur " (415, vi, 150) ; (2) walnut (fruit of *Juglans regia*) :—" Nux ipsa ex quatuor componitur substantiis. Exterior enim quae est carnosa . . . est multum amara ; intra quam continetur testa. . . . Sub testa autem est pellis, in qua nucleus involvitur, et in ipsa nucleus quasi per quartas divisus" (414, vi, 148) ; (3) walnut-tree, *Juglans regia* :—" De nuce et aliis arboribus quae nuces habent " (414, vi, cap. xxvii.)

officialis, functional ; *officium,* function :—" Nodi enim et iuncturae et viae per modum venarum extensae et radices sicut membra officialia ad nutrimenti officium deservientia " (116, ii, 35).

olescere (of herbs), to become caulescent, to produce a branched stem :—" Quaedam autem habent partes ad invicem similes, sicut est beta et caulis, quamdiu est herba, antequam olescat sive in figuram oleris convertatur " (70, i, 139).

olus, olus virens, bushy herb :—" Est autem et aliud medium, sed multum ad herbae accedit proprietatem, quod vocatur olus virens ab auctoribus, quod quidem multos stipites projicit ex una radice, et in stipitibus ramos diversos, sed parum aut nihil ligneitatis, licet quaedam eorum durescant ad modum ligni in senectute longa. In quo genere sunt ruta et caulis et plura alia " (76, i, 155) : " Acelga [*Beta*] et multa alia, quae primum sunt herbae, et postea sunt olus " (78, i, 159).

os (lit. bone), hard part or " stone " of a fruit, e.g. (1) stone (endocarp) of a drupe :—" Fructus . . . quidam componuntur ex carne et osse et grano, sicut pruna secundum omne genus suum " (84, i, 177) ; (2) hard endosperm of *Phoenix dactylifera* :—" Quidam [fructus] ex carne et osse [componuntur] sicut dactili " (85, i, 177) : " Nucleus autem palmae, qui os dactilorum suorum vocatur, virtutem generandi et pullulandi habet quasi a dorso suo " (425, vi, 170).

palea, glume :—" Aliquid autem hinc simile patiuntur genera granorum, quae maturantur in paleis et quisquiliis palearum " (172, iii, 18).

palmes, long branch :—" Frutex est, quando palmites multi egrediuntur de radice una " (70, i, 139) : " Improprie tamen surculi etiam dicuntur palmites, qui pullulant a stipite et a ramis in diversis partibus plantae " (73, i, 146).

pampinus, leaf of the grape-vine :—" Est enim pampinus frequenter ex opposito racemi in vite " (72, i, 142) : " Hoc autem folium pampinus vocatur " (459, vi, 237).

panniculus (=*panicula*), cluster, lump :—" Semen eius [sc. violae] collectum est in panniculo sine distinctione et ordine " (575, vi, 464).

partes essentiales plantarum, permanent members of the plant body, i.e. the root and its branch roots, and the stem and its branches :—" Partes autem, quas dicemus et diximus, omnium sunt plantarum, quae crescentes sunt et auctae cum ipsis crescentibus et auctis : et istae sunt partes essentiales plantarum, et istae sunt radices et virgae et stipites plantarum et rami " (72, i, 143).

patulus, spreading :—" Fagus autem est arbor . . . procera multum et patula in ramis " (389, vi, 105).

pellicula (dim. of *pellis*), (1) seed-coat (179, iii, 36 ; 419, vi, 158) ; (2) thin pericarp of a cypsela :—" Aliae autem plantae sine siliqua, in simplici pellicula grani, nuda proferunt grana " (167, iii, 9) ; (3) layer of bast (253, iv, 84).

pellis (lit. skin, hide), (1) seed-coat (testa) :—" Ille [fructus olivae] enim habet corticem et carnem et testam durissimam et nucleum, qui est semen eius, qui et ipse habet pellem extra in testa circa se, in qua involvitur. . . . Nuces habent circa testam carnem quandam et testam et interiorem pellem, et amigdala similiter et persica et multa alia " (64, i, 128) : " Arilli [sc. semina *Vitis viniferae*] . . . pelle forti " (171, iii, 17) : " Nigra, autem non polita, est pellis sicut in faba nigra et papavere nigro et nucleis malorum et pirorum apud nos notorum " (179, vi, 37) ; (2) epicarp :—"Et tunc primo mollescere incipiunt huiusmodi fructus, et incipit subtiliari pellis eorum " (185, iii, 55) ; (3) layer of bast (574, vi, 462).

pendiculus (lit. a cord), peduncle, pedicel :—" Scyphus . . . nec per cotyledonem sive pendiculum aliquod coniungitur ramulo, sed immediate sedet super ipsum " (441, vi, 205) : " Quaelibet uva pendiculum habet, per quod racemo infigitur " (460, vi, 239).

pepansis (*fructuum*), maturation (of fruits) :—" Fructus completi sunt per pepansim " (142, ii, 100).

pepanus, mature :—" Fructuum autem pepanorum color ut in pluribus est croceus vel rubeus, et immaturorum color est viridis " (180, iii, 41) : " Omnium autem fructuum pepanorum proprium est cadere " (182, iii, 46).

pili (lit. hairs), the dried stigmas of the saffron crocus :—" Flos enim non habet folia nisi sicut pili vel fila stricta " (489, vi, 297).

pinguis, (1) (*sapor*), fatty, oily (taste) (195, iii, 78) ; (2) (*terra*) rich (soil) (417, vi, 156).

pistillum, pestle (532, vi, 374).

plantae adulterinae, weeds (604, vii, 35).

pomarium, orchard (649, vii, tract. 2, cap. iii).

pomulum (dim. of *pomum*), lit. little fruit, used for the fruit of *Buxus sempervirens* :—" [Buxi genis] quae magis exaltatur, minus dilatatur in ramis, et profert pomula quaedam aculeata superius " (359, vi, 46).

pomum, fruit, used to denote both fleshy and woody " fruits," e.g. of *Pinus* (61, i, 122), *Musa* (347, vi, 19), *Pyrus, Citrus* (363, vi, 53, 54), *Cupressus* (365, vi, 57), *Rosa, Ficus* (366, vi, 59), *Cucumis* (378, vi, 81), *Cydonia* (381, vi, 89), *Punica* (397, vi, 118), *Rubus* (444, vi, 210).

ponticitas, astringency (283, iv, 155).

ponticus (*sapor*), raw, rough, harsh, astringent (taste) (195–199, iii, 79, 82, 85, 86 ; 460, vi, 239).

post fructum=infra fructum, below the fruit :—" Aliquando autem [situs florum] est post fructum subtus ita quod formatio fructus fit de medio floris, sicut in cinorum et prunorum floribus invenitur " (154, ii, 128).

pullulare, to sprout ; *pullulare ex semine*, to germinate (90, i, 186) :—" Os dactilorum . . . virtutem generandi et pullulandi habet quasi a dorso suo " (425, vi, 170).

pullulatio, (1) sprouting, sprout :—" Pullulationes surculorum in diversis locis corporum suorum " (61, i, 124) ; (2) *pullulatio ex semine*, germination :—" Invenitur autem triplex diversitas in pullulatione plantae ex ipso semine " (260, iv, 99) ; (3) sucker :— " Quando praescinduntur magnae arbores, et succus radicis non attrahitur in stipitis et ramorum cibum, statim plurimae pullulationes de radicibus nascuntur " (27, i, 48) ; (4) plumule :—" Omnes autem pullulationes semina, quae sunt acuta pyramidalem figuram habentia, emittunt ex parte acuta " (187, iii, 60).

pullus (lit. young animal, hence sprout), sucker :—" Arbores altissimae non generant pullos " (27, i, 48).

pulvis croceus (lit. yellow powder), pollen :—" Aliquando autem sicut pulvis croceus spargitur in loco formandi fructus, sicut in vite et paucis aliis fructibus " (154, ii, 128).

puniceus, purple :—" Daucus . . . habet florem album coronalem, in cuius medio est flos alius puniceus valde parvus " (506, vi, 328).

purgamentum, lit. excretion, used for the male catkin of *Juglans* (414, vi, 147), and *Corylus* (415, vi, 150).

purpureus, purple :—" Purpureus autem color . . . quasi mediat inter rubeum et nigrum, plus habens de rubeo, quam de nigro " (162, ii, 147).

quinarius, a set of five parts : (1) a whorl of five branches (341, vi, 3) ; (2) a pentamerous whorl of a flower :—" Borago herba . . . habet . . . florem iactinctinum, ut stellam dispositum in quo est compositio quinque quinariorum " (485, vi, 291).

quisquilia, chaff :—" Genera granorum quae maturantur in paleis et quisquiliis palearum " (172, iii, 18).

racemus, rhachis of a bunch of grapes :—" Racemus . . . super quod fundantur omnes uvae, quae sunt in botro " (459, vi, 239).

radix, (1) root or underground stem :—" Radix enim plantae est mediatrix organice inter plantam et cibum " (72, i, 144) : " Cepa est in colore porri et sapore, habens . . . radicem circularem grossam " (487, vi, 295) ; (2) base, insertion :—" Jujuber . . . spinam habet in sui folii radice " (364, vi, 55) ; (3) radish (*Raphanus sativus*) :— " Radix est speciale nomen herbae, cuius radix est valde magna, et ideo autonomastice radix vocatur " (556, vi, 423).

radix dentata, bulb of *Lilium* and corm of *Crocus* (488, vi, 297).

ramulus, branch of infructescence, e.g. of *Phoenix dactylifera* :— " In capsa simul profert ramulos et dactilos in ramulis illis " (428, vi, 177).

ramus, bough, main branch :—" Rami autem sunt partes illae quae immediate a stipite, non in loco surculorum, superius vero supra stipitem oriuntur. . . . Ramos autem habentium plantarum quaedam non sempiterne retinent eos, sed anno post annum renovant. . . . Tamen propriissime rami dicti non sunt nisi arborum, et non arbustorum vel fruticum vel olerum vel herbarum " (73, i, 147).

ramus folialis, rhachis of a pinnate leaf :—" Fraxinus . . . multa folia producit ex uno stipite vel ramo foliali " (391, vi, 108).

ramusculus, (1) branchlet :—" Haec folia sunt ramusculis et folia et cortex " (365, vi, 56) : " Fibex . . . est autem arbor sterilis . . . multorum minutissimorum ramusculorum in ea dependentium" (390, vi, 107) ; (2) young branch or leading shoot (341, vi, 3).

respergere, to sprinkle :—" Dum enim formatur flos, id, quod habet terrestre, cum pingue facile inflammabili rejicitur, et ad modum farinae respergitur super interiora floris " (150, ii, 122).

respersio (lit. sprinkling), pollen :—" In campestri rosa non inveniuntur nisi quinque folia. In medio autem est respersio crocea, stans in culmo uno simul " (445, vi, 213).

reticulatio, reticulation, network of veins in a leaf :—" Venae autem, quae sunt in foliis, et reticulatio causantur ex terrestri sicco " (143, ii, 105).

rubeus, red in a general sense (160, ii, 141), including : pink, e.g. the flower of *Centaurium umbellatum* (499, vi, 311) ; pale purple, e.g. *Fumaria officinalis* (518, vi, 347) ; purple, e.g. *Agrostemma Githago* (543, vi, 376).

rubicundus, deep red, e.g. the flower of the common peony (552, vi, 414).

rubus, (1) bush with long flexible branches :—" Sed medium inter haec [frutices] habet nomen proprium apud nos, et vocamus ipsum rubum, et hoc est, quod longitudinem magnam habet in ramis, et minorem ligneitatem quam frutex " (76, i, 154) ; (2) bramble, *Rubus fruticosus* :—" Rubum vocamus vepres, quae mora dulcia habent, et repunt super plantas alias sibi vicinas " (411, vi, 143).

rufus, scarlet, applied to the petals of *Papaver Rhoeas* (160, ii, 141), and the berries of *Arum maculatum* (485, vi, 290).

salsus (*sapor*), salty (taste) (194, iii, 76).

sarmentum, slender shoot (656, vii, 172).

scabiosus, rough, scabby :—" Scyphus autem, in quo sedet glans ipsa, . . . exterius est scabiosus, habens superficiem asperam " (441, vi, 205).

scabrosus, rough, scabrous, e.g. the bark of *Ulmus* :—" Ulmus autem est arbor magnae quantitatis, habens asperum corticem et scabrosum, quando antiqua fuerit " (467, vi, 256).

sceptrum, scion, graft (307, v, 43 ; 312, v, 54).

scyphulus (lit. little cup), (1) cupule of an acorn (440, vi, 204) ; (2) operculum of circumscissile capsule of *Hyoscyamus* (526, vi, 362).

scyphus (lit. cup), cupule of an acorn :—" Scyphus autem, in quo sedet glans ipsa, est concavus, bene formatus, quasi esset tornatilis intus; cuius fundus est aliquantulum planus, in quo glans sedens suxit nutrimentum ; et exterius est scabiosus habens superficiem asperam " (441, vi, 205).

sedere (lit. to sit), to be sessile :—" Scyphus . . . nec per cotyledonem sive pendiculum aliquod coniungitur ramulo, sed immediate sedet super ipsum " (441, vi, 205).

sedes (lit. seat), place of insertion :—" Grana ordei arefacta sede de facili decidunt " (640, vii, 128) : " Sedes floris " (403, vi, 129).

semen, (1) seed, collectively (543, vi, 396) ; (2) an individual seed (166, iii, 7) ; (3) seed-like fruit, e.g. of *Compositae* and *Umbelliferae* (167, iii, 9 ; 495, vi, 306) ; (4) fruit of *Cassia Fistula* :—" Fructus autem, qui sunt semina quaedam longa, producit, quorum capsa succedente tempore prolongatur, postea autem indurantur semina, cortice forinsecus exsiccato . . . Crescunt autem in una capsa plus quam quadraginta semina simul " (375, vi, 75).

semper virens, evergreen :—" Edera est arbor nota et communis, semper virens " (385, vi, 97).

siliqua, (1) spathe of *Phoenix dactylifera* (427, vi, 175), of *Arum maculatum* (485, vi, 290), of *Allium* and *Umbelliferae* (167, iii, 9) ; (2) glumes of an ear of corn :—" [Frumentum] grana autem sua profert in spica, quae est multarum siliquarum, ita quod quodlibet granum eius est in pluribus siliquis " (519, vi, 349) ; (3) calyx :—" In folliculis autem et siliquis flores formantur propter teneritudinem ipsorum ; aliter enim frequenter laederentur frigore " (151, ii, 124) : " In mespilo . . . siliqua floris remanet in anteriori pomi maturi " (447, vi, 215) : " Nigella est herba . . . rubeo flore quae exit de siliqua viridi " (543, vi, 396) ; (4) a dry dehiscent seed vessel :—" Quae [semina] autem nullam habent circumpositam sibi carnem, sed in siliquis complentur, sunt, quae interiori et maturo abundant primo humido " (171, iii, 18) : e.g. the capsule of *Papaver* (149, ii, 117), the capsule of *Reseda* (521, vi, 352), the legume of *Leguminosae* (167, iii, 8) :—" Hoc autem cooperculum [seminum] in quibusdam est vocatum siliqua, sicut in pisa et faba " (85, i, 177) ; (5) pericarp in general (166, iii, 6) ; (6) pericarp of a nut, e.g. *Quercus* (440, vi, 204) ; (7) core of an apple or pear :—" Quoniam quaedam extra siliquam in qua sunt semina, habent carnem sicut poma omnia, quae mala dicuntur vel pira " (166, iii, 7).

silvestris, (1) wild :—" Quoniam plantarum quaedam est domestica, quae cultu nutritur adhibito; quaedam autem cum hoc hortensis vult esse, quae defendi vult a communi frequentatione animalium; et quaedam est silvestris, omnino sine cultu et protectione germinans " (79, i, 163); (2) abaxial, distal (364, vi, 55), or exterior (429, vi, 179).

spathula, *spatula*, spathe of *Phoenix dactylifera* (93, i, 189; 428, vi, 179).

spica, (1) spike, ear of corn, e.g. of wheat, barley and rye (519, vi, 349; 544, vi, 399; 640, vii, 128), infructescence of *Panicum* and *Setaria* (523, vi, 357); (2) spike-like inflorescence of *Lavandula Stoechas* (562, vi, 433); (3) bulb of *Allium*, in allusion to its spike-like sprout (482, vi, 284); (4) stamen of *Clematis Vitalba* :—" Post casum quarundam spicarum floris vitis albae, quae circumstat pullulationem lanuginis, tunc expanditur lanugo " (462, vi, 245).

spina, (1) spine; (2) woody prickle (emergence) :—Inveniuntur autem duo genera spinarum in plantis. Sunt enim spinae, quae ex profundo plantae educuntur; et hae quidem rectae et longae sunt propter calorem materie. Sunt etiam quaedam spinae, quarum basis non profundatur in corpus plantae sed stat super corticem, quasi extrinsecus adhaerens plantae; et sunt istae spinae breves, recurvae anterius, et peracutae, sicut sunt spinae tribulorum et bedegar et rosariorum et ramni et aliarum multarum " (266, iv, 114); (3) prickly bush or shrub, e.g. *Rosa canina* (358, vi, 43).

spinetum, spiny bush :—" Vocamus enim frutices ea, quae multos ex una radice ramos emittunt, cum tamen sint lignei rami, sicut sunt spineta quaedam " (76, i, 154).

spissitudo, thickness, e.g. of leaves :—" Spissitudo autem et tenuitas foliorum, similiter autem et latitudo et strictura eorundem in plantis invenitur " (146, ii, 110).

spissus, thick :—" [*Viscum album*] habet folia spissa, in hieme retinentia virorem, et sunt fere sicut folia olivae, nisi quod in colore declinant aliquantulum ad croceitatem citrinam " (253, iv, 84).

stipes, (1) erect main stem of a tree or other plant, or one of several main stems from a root :—" Stipes autem plantae est, quae sola a terra nascitur, a radice quasi perpendiculariter ad rectos angulos erecta, est sicut statura erectionis plantae " (72, i, 145): "Arbor enim est, quae habet ex sua radice stipitem fortem " (75, i, 153): " Olus virens . . . quod quidem multos stipites projicit ex una radice (76, i, 155); (2) rhachis of a leaf, e.g. of *Achillea Ptarmica* (550, vi, 411); (3) petiole (484, vi, 289).

stipula, stalk, culm, stubble :—Hoc invenitur . . . praecipue in his, quarum herba concava est, sicut stipula " (113, ii, 26): " Cum autem grana, quae dicta sunt, messa fuerint, generaliter dicitur de omnibus esse compertum, quod in stipulis suis diutius conservantur quam expressa " (642, vii, 135).

strictura, narrowness, e.g. of leaves :—" Strictura autem foliorum ex siccitate et viscositate calidi humoris generaliter fit " (147, ii, 112).

strictus, lit. drawn out, hence narrow :—" Salix [*Salix alba*] . . . folium habet longum et strictum, latius quam sit folium amigdali " (449, vi, 218) : " Et folia illa sunt frequenter lata superius, et strictiora inferius, sicut caulis et blitus et plantago et huiusmodi " (146, ii, 109) : " Quarundam autem [folia] sunt stricta valde, sicut juniperi et abietis " (82, i, 168).

stypticus (*sapor*), harsh, sour, rough and somewhat astringent (taste) (199, iii, 87).

superfluitas, excretion, used for the male catkin (amentum) of *Alnus*, *Juglans* and *Corylus* (351, vi, 28).

surculus, sucker :—" Surculi vero proprie sunt virgae e radice arboris circa stipitem pullulantes " (73, i, 146).

tela, lit. web, (1) pericarp of a cereal grain (85, i, 177) ; (2) seed-coat (testa) :—" In nucibus magnis est casta et testa et tela circa nucleum " (85, i, 177) : " Testa eius [sc. nucis indicae] est nigra, et nucleus eius est involutus in tela sicut et nuclei aliarum nucum" (416, vi, 152).

tenuitas, thinness, e.g. of leaves (146, ii, 110).

tenuis, thin :—" Folia autem ipsius [sc. *Fagi sylvaticae*] sunt tenuia " (390, vi, 105).

terrestreitas, solidity (vide seq.).

terrestris (class. terrestrial), lit. earthy, hence solid :—" Linea autem illa est viridis, durior et terrestrior quam folia, et minus habens terrestreitatis quam ramusculus " (414, vi, 147) : " Nux autem ipsa ex quatuor componitur substantiis. Exterior enim, quae est carnosa, et non dura multum terrestris, est multum amara ; intra quam continetur testa, quae magis est terrestris et minus aquea quam exterior " (414, vi, 148).

testa (lit. brick, tile, hence earthenware pot, shell, skull), (1) hard pericarp of a nut, e.g. *Corylus Avellana* (85, i, 177) ; (2) hard pericarp of a capsule, e.g. *Agrostemma Githago* (543, vi, 396) ; (3) endocarp of a drupe, e.g. *Olea europaea* (64, i, 128), *Juglans regia* (414, vi, 148), *Cocos nucifera* (416, vi, 152), *Amygdalus*, *Prunus* (438, vi, 200, 201) ; (4) seed-coat, e.g. *Cupressus sempervirens* (365, vi, 58).

testeus (lit. having the consistency of earthenware), hard and shell-like, e.g. the stone (endocarp) of *Prunus* and *Cerasus* (166, iii, 7), and the capsule of *Agrostemma Githago* :—" Testeum est illud vas seminis . . . et est valde frangibile et tenue " (543, vi, 396).

theca (lit. envelope, cover, case, sheath), applied to : (1) involucre of *Castanea* :—" Fructum autem suum habet in hispida and hirsuta et spinosa theca, sicut et fagus " (360, vi, 47) ; involucre of *Tragopogon* (547, vi, 404) ; (2) calyx of *Borago* (485, vi, 291) ; (3) capsule of *Hyoscyamus niger* (526, vi, 362) ; of *Agrostemma Githago* (543, vi, 396) ; (4) follicle of *Paeonia* (552, vi, 414) ; (5) core (pericarp) of the pear, *Pyrus communis* (434, vi, 191) ; (6) pericarp of *Fraxinus* (391, vi, 108) ; (7) pseudocarp of *Rosa* (543, vi, 396) ; (8) wall of incomplete loculus of the capsule of *Papaver* :—

" In capite autem suo habet thecas ordinatas multas per circuitum " (554, vi, 419).

thyrsus, relatively slender straight stem, e.g. of *Nerium Oleander* (423, vi, 165).

tunica (lit. tunic, undergarment), (1) layer of tissue :—" Crescit planta quasi per quasdam tunicas herbales vel ligneas " (121, ii, 49) ; (2) bulb-scale of *Allium* (487, vi, 295).

tunica lignea, annual ring of wood :—" Crescit autem substantia eius per circuitum a radice rursum ex tunicis ligneis " (361, vi, 49).

unctuosus (*sapor*), oily, fatty (taste) (195, iii, 78).

uva, grape (74, i, 150 ; 459, vi, 239).

uva lupi, *uva lupina* (lit. wolf grape), *Solanum nigrum* : " Solatrum est herba nota, habens folia multa viridia, et habet semen, ac si esset uva, propter quod etiam a quibusdam uva lupi vocatur " (567, vi, 442) : " Silvestris autem et montana [vitis] habet ramos valde longos similes ramis vitis domesticae, sed folia habet sicut uva lupina, quam nos solatrum vocamus " (463, vi, 248).

vas seminis, *vas seminum*, lit. vessel containing the seeds : (1) fleshy receptacle of fruit of *Rosa* (543, vi, 396) ; (2) capsule of *Agrostemma* (543, vi, 396) ; (3) *duo vasa*, the two layers of a drupe, flesh and stone, e.g. in *Prunus* (170, iii, 14).

vena (lit. vein), (1) vascular bundle :—" [Venae] sunt viae rectae, in quibus decurrit nutrimentum " (58, i, 144) : " Veniunt etiam viae istae aliquando a radice ascendentes, aliquando autem ex medulla ad exteriora plantae " (122, ii, 49) ; (2) esp. vein of the leaf :—" In medio autem dorso folii, ubi est vena nutrimenti folii, est vena citrina declinans ad albedinem " (521, vi, 352).

vepres, thornbush, prickly bush (384, vi, 93 ; 411, vi, 143).

via venalis, vascular bundle :—" Hoc . . . cognoscitur in urtica maiore et canabo et lino et linaria, et in multis aliis plantis, quae vias venales habent multum fortes et viscosas et directas " (125, ii, 59).

violaceus, made from violets, e.g. *oleum violaceum* (548, vi, 405).

virens hieme et aestate, evergreen (359, vi, 45).

virga, (1) slender branch, whether of the stem or root (61, i, 124) ; (2) rhachis of inflorescence of *Agrimonia Eupatoria* (482, vi, 283), and *Reseda Luteola* (521, vi, 352).

virgula (dim. of *virga*), lit. little rod : (1) stamen :—"Ad intrinsecus floris [*Boraginis officinalis*] sunt quinque virgulae iacinctinae longae et rectae " (485, vi, 291) : " Circa eam [sc. stylum *Lilii candidi*] stant breviores quaedam et debiliores virgulae, omnes habentes croceos nodos molles " (530, vi, 370) ; (2) style :—" In medio illarum [sc. staminum] est una virgula longior illis, et illae sunt spicae floris " (485, vi, 291) : " Flos . . . in medio profert virgulam longam, quae habet nodum sicut clavus aut terminus (530, vi, 370).

virgula parvula, (1) rhachis of an inflorescence, e.g. of *Vitis* (74, i, 150) ; (2) rhachis of a pinnate leaf, e.g. of *Juglans* (l.c.).

viridarium, pleasure-garden, consisting of a lawn surrounded by a border of flowers and aromatic herbs, with a certain number of trees for shade (636, vii, cap. xiv).

zizania, (1) lit. darnel (583, vi, 479); (2) a weed of any crop (554, vi, 420; et l.c.).

LVI—NOTES ON THE FLORA OF SOUTHERN AFRICA : IV.* MISCELLANEOUS NEW SPECIES. R. A. DYER.

Fockea gracilis *R. A. Dyer*, sp. nov. [Asclepiadaceae]; affinis *F. sinuatae* (E. Mey.) Druce, a qua caulibus superne tortuosis, marginibus foliorum minus undulato-sinuatis, coronae tubo lobis longiore differt.

Herba perennis, radice tuberosa. *Tuber* plus minusve oblongum, 15–20 cm. crassum, radicibus paucis tenuibus instructum; caudex perennis, subterraneus, sparse ramosus, usque ad 20 cm. longus, circiter 1 cm. crassus, succulentus vel sublignosus. *Caules* annui, graciles, superne tortuosi, 15–30 cm. longi, leviter carnosi, minute puberuli. *Folia* sessilia, linearia, 2–3 cm. longa, 1–2 mm. lata, supra minute puberula, infra glabra, apice incurvata, acuta, marginibus undulato-sinuatis reflexis vel revolutis. *Flores* axillares, 2–6-ni, in racemis brevissimis dispositi vel fasciculati; pedicelli 1–2·5 mm. longi, puberuli. *Calycis* segmenta anguste oblongo-lanceolata vel lineari-oblonga, 2 mm. longa. *Corolla* campanulata, extra puberula; tubus 3–3·5 mm. longus; lobi lineares, 6–7 mm. longi, 1 mm. lati, obtusi, intus glabri vel sparse et minutissime puberuli, viridi-fusci. *Corona* tubulosa, 5 mm. longa, basi cum tubo corollae 1 mm. conjuncta, eo paullum exserto; tubus 3·5 mm. longus, intra appendicibus 5 subulatis instructus; lobi 5, tridentati, 1·5 mm. longi. *Antherae* breves, erectae, membrana maxima elliptica hyalina terminatae.

EASTERN CAPE PROVINCE: Albany Division; amongst short Karroo bushes on Dikkop Flats, 22 miles from Grahamstown, rare, March, *Dyer* 1251 (type).

Fockea cylindrica *R. A. Dyer*, sp. nov. [Ascelepiadaceae]; affinis *F. eduli* (Thunb.) K. Schum. et *F. crispae* (Jacq.) K. Schum., ab illa foliis supra paullum glaucis, corollae segmentis linearibus 7–8 mm. longis, coronae tubo quam corollae tubo breviore, ab hac foliis glabris et paullum glaucis, ab ambabus corollae tubo cylindrico 4 mm. longo differt.

Herba perennis, radice tuberosa magna. *Caules* perennes, sublignosi, sparse ramosi; rami annui graciles, herbacei, minutissime puberuli, usque ad 25 cm. longi vel verisimiliter longiores. *Folia* opposita, brevissime petiolata, ovata vel oblongo- vel elliptico-ovata, acuta vel acute apiculata, 1·6–2 cm. longa, 0·8–1 cm. lata, glabra, supra paullum glauca, marginibus plus minusve undulatis. *Flores* 2–4-ni, in fasciculis axillaribus dispositi; pedicelli 2 mm. longi,

---

*Continued from *K.B.* 1932, 512.

puberuli. *Calycis* segmenta lanceolata, 2–2·5 mm. longa. *Corolla* extra dense puberula, lobis intus glabris vel faucem versus puberulis; tubus cylindricus, 4 mm. longus; lobi lineares, 7–8 mm. longi, in alabastro valde, flore aperto minus tortis, marginibus revoluto-plicatis. *Corona* tubulosa, tubo ejus corollae tubo breviore basi circiter 1 mm. cum hoc conjuncta, intra appendicibus 5 filiformibus instructo; lobi 5, tridentati, 3 mm. longi, dentibus 5 parvis alternis. *Antherae* breves, erectae, membrana maxima elliptica hyalina terminatae.

EASTERN CAPE PROVINCE: Albany Division; amongst karroid scrub on dry flats, near Committees in the Fish River Valley, 20 miles from Grahamstown, rare, Aug., *Dyer* 1635 (type).

The above two rarities will be figured in Hooker's Icones Plantarum during this year. It seems to be generally the case that species of *Fockea* are represented by comparatively few individuals, although not always restricted to a small area. The fact that the tubers of certain species are edible and are utilised by both man and animals may account for this to a considerable extent.

The two species to which *F. cylindrica* is most nearly allied, namely *Fockea edulis* (Thunb.) K. Schum. and *F. crispa* (Jacq.) K. Schum., are under the names *F. glabra* Decne. and *F. capensis* Endl. respectively in Dyer, Fl. Cap. **4**, sect. 1, 779–780. The former two specific epithets take priority according to the International Rules.

Hibiscus aridus *R. A. Dyer*, sp. nov. [Malvaceae]; affinis *H. pedunculari* Linn. f., a quo foliis late ovatis vel orbiculato-ovatis superne stellato-scabridis, floribus luteis, seminibus pilis longis lanatis differt.

Suffrutex 20–60 cm. altus, ramis rectis tenuibus, indumento patente stellato-scabrido et pilis paucis simplicibus indutis. *Folia* late ovata vel orbiculato-ovata, obtusa, basi truncata vel cordata, 2–5 cm. longa, 1·5–4 cm. lata, marginibus crasse dentatis, utrinque pilis 4–7-radiatis scabrida; petioli 1–2 cm. longi, basi stipulis 2 instructi; stipulae 5–8 mm. longae, subulatae. *Flores* solitarii, axillares; pedicelli usque ad 10 cm. longi, plerumque foliis multo longiores, infra calycem circiter 0·5–1 cm. articulati. *Epicalyx* 6–8-lobatus, lobis linearibus acuminatis vel acutis 1·3–1·8 cm. longis, pilis stellatis et etiam interdum paucis simplicibus instructis. *Calycis* tubus 2–3 mm. longus; lobi lineari-lanceolati, 1·2–1·7 cm. longi, stellato-scabridi. *Corolla* plus minusve 7 cm. expansa, lutea, glabra; petala obovata, basi cuneata, apice rotundata. *Columna* staminea 7–8 mm. longa. *Stylus* 5-ramosus, ramis 3–4 mm. longis teretibus, stigmatibus capitatis hispidis. *Capsula* globosa, 10–15 mm. diametro, glabra, in loculis seminibus 3–5 subtriangulatis pilis longis lanatis.

EASTERN CAPE PROVINCE: Albany Division; between Pluto's Vale and Committees, in the Fish River valley karroid scrub, Jan., *Dyer* 1829 (type); near "Lifford" farm, Dec., *Britten* 5545; Alicedale, *Cruden* 133. Bathurst Division; Port Alfred, May, *Rogers*, without no. Uitenhage Division; hills near Uitenhage, Dec., *Prior*, without no.

The type specimen has no ripe capsules, and the characters given in the above description were taken from *Britten* 5545. *H. aridus* is evidently a comparatively rare endemic species limited to the dry karroid scrub from Uitenhage to Albany and Bathurst Divisions. It is distinguished by its large dark yellow flowers on long peduncles, ovate or ovate-orbicular leaves, stellate-hispid on both surfaces, and lanate seeds.

Sebaea cleistantha *R. A. Dyer*, sp. nov. [Gentianaceae]; affinis *S. acutilobae* Schinz, a qua habitu robustiore, inflorescentia multo densiore, floribus majoribus cleistogamis, stigmate stylo duplo longiore differt.

Herba annua, erecta, 5–25 cm. alta. *Caulis* infra simplex, superne ramosus, costatus. *Folia* glabra, opposita, late ovata vel suborbiculata, 5–12 mm. longa, 5–10 mm. lata, obtusa, inferiora plus minusve conferta, superiora distantia, paribus 3–6. *Flores* in cymis dense ramosis vel leviter subramosis corymbiferis dispositi. *Calyx* 3–4 mm. longus, segmentis anguste lanceolatis vel ellipticis acuminatis carinatis vel alatis; alae medio latissimae, circiter 0·5–1 mm. latae vel juniores angustiores. *Corolla* 5–7 mm. longa; tubus 3–4·5 mm. longus; lobi 2–2·5 mm. longi, 1·5–2 mm. lati, late ovati, obtusi. *Filamenta* brevissima, basi sinuum corollae inserta; antherae 0·75–1 mm. longae, apice glandula instructae. *Stylus* 0·5 mm. longus, stigmate et glandulis confluentibus 1 mm. longis. *Fructus* ovato-oblongus, 2·5–3 mm. longus.

EASTERN CAPE PROVINCE: Port Elizabeth Division; Walmer, Sept., *Paterson* 770a. Bathurst Division; Port Alfred, Oct., *Paterson* 7; Kowie, on margin of dry pan, common in a small area only, alt. 20 ft., Oct., *Dyer* 629 (type).

Although the type specimen was collected during bright sunshine, the corolla-lobes of flowers in all stages of maturity remained twisted and closed as in the bud stage; nor are there open flowers on either of the other two herbarium specimens quoted, a character not observed in any other species.

Thesium congestum *R. A. Dyer*, sp. nov. [Santalaceae]; affine *T. folioso* A.DC., foliis densioribus et brevioribus superne recurvatis, disco distincto, floribus solitariis in axillis bractearum in racemis spiciformibus densis dispositis, perianthii segmentis nec papillosis nec profunde cucullatis differt.

Suffrutex usque ad 45 cm. altus, lignosus, multo ramosus, glaber; rami 2–2·5 mm. diametro, foliorum basibus decurrentibus costati. *Folia* sessilia, dense imbricata, anguste lineari-lanceolata, 6–8 mm. longa, 1–1·5 mm. lata, supra plana, infra leviter carinata, basi decurrentia, superne recurvata, luteo-viridia, margine minutissime scabrido vel laevigato. *Flores* solitarii in axillis bractearum in racemis spiciformibus densis dispositi. *Bracteae* anguste lanceolatae, 3–3·5 mm. longae, supra concavae, superne recurvatae,

floribus longiores, margine minutissime scabrido vel laevigato; bracteolae bracteis angustiores et breviores, floribus longiores, superne recurvatae. *Perianthium* circiter 1·5 mm. longum; segmenta triangulari-ovata, haud papillosa, haud vel leviter cucullata, 1 mm. diametro. *Filamenta* brevissima; antherae e perianthii tubo exsertae, 0·25 mm. longae. *Discus* distinctus, circiter 1 mm. diametro. *Stylus* 0·5 mm. longus. *Fructus* subsessilis, globosus, 2 mm. crassus, costatus, perianthio diu persistente.

EASTERN CAPE PROVINCE: Stockenstrom Division; Katberg, near "The Gorge," 6500 ft., Nov., *Dyer* 741 (type); Victoria East Division; Hogsback, Dec., *Rattray* 54.

LVII—MISCELLANEOUS NOTES.

RETIREMENT OF MR. SKAN.—Mr. Sidney Alfred Skan retired from the post of Botanist in the Herbarium on September 30th, 1933.

Mr. Skan entered Kew as a Student Gardener on September 19th, 1892, and was promoted to be an Assistant (later Botanist) in the Herbarium on July 16th, 1894. His interest in books early marked him out to assist in the Library and gradually he took on the duties of Librarian, a "post" which he held until his retirement this year. Mr. Skan's unique knowledge of botanical literature has been of the greatest value in the Herbarium, and his proverbial readiness to help enquirers rendered this knowledge available to all. In addition his wide knowledge of plants has always been of great assistance to his colleagues. His systematic work included an account of the difficult family *Scrophulariaceae* for the "Flora of Tropical Africa" (with W. B. Hemsley), the *Salicaceae* and part of *Labiatae* for the "Flora Capensis," and most of the *Cupuliferae* for the "Index Florae Sinensis."

We wish Mr. and Mrs. Skan many happy years of retirement.

DR. T. A. SPRAGUE, Deputy Keeper of the Herbarium and Library, is now in charge of the work of the Library, with MR. E. NELMES, Assistant Botanist, as his assistant.

MISS WINSOME BARKER.—We learn with pleasure that Miss Barker has received an appointment on the staff of the National Botanic Gardens, Kirstenbosch, South Africa. Miss Barker had been employed by Kew at the Bolus Herbarium, with the aid of a grant from the Bentham-Moxon Trust Fund, from Feb. 1st, 1931, until July 31st, 1933, during which period she made very valuable additions to our collections of living and dried South African plants. She has worked especially on the Monocotyledons, *Mesembryanthemum*, and other groups, and her skill in preparing dried specimens and in botanical drawing has proved of great value to Kew.

CHARLES CARMICHAEL LACAITA.—By the death of Mr. C. C. Lacaita on July 17th, Kew has lost an old and valued correspondent and a frequent and welcome visitor to the Herbarium. Lacaita collected widely in France, Spain, Greece, Italy, Switzerland and elsewhere and made many important contributions to the study of the European flora. His attention was often directed to critical matters of nomenclature with regard to European plants and he was able to clear up several uncertain points and settle the status of doubtful species. Many of his critical researches are published in his best known series of papers, issued under the title " Piante Italiane critiche o rare," in Nuov. Giorn. Bot. 1910–1927. In 1913 he visited Sikkim and published an account of his collections in Journ. Linn. Soc. Bot. **43,** 457 (1916). He published, in Journ. Bot. **67,** 107 (1929), Gay's descriptions of Durieu's Asturian plants, abstracted from the Gay manuscripts at Kew. In the "Kew Bulletin" 1919, 321, a lengthy and learned article on the Jerusalem Artichoke appeared from his pen. His herbarium collections have been presented or bequeathed to the British Museum (Natural History).

DR. M. O. MALTE.—The death on August 4th, at the age of 53, of Dr. M. O. Malte, Chief Botanist, National Museum of Canada, is a great loss to Canadian botany. Dr. Malte, who was a native of Sweden, had acted for thirty years as Research Botanist of the Federal Government. In this capacity his work was largely of an economic character, but he had an extensive knowledge of the flora of Canada and Arctic North America, and had specialized on the family *Gramineae*. As a member of the Canadian Arctic Expedition, 1927, he visited Greenland and the principal islands in the eastern part of the Canadian Arctic Archipelago, obtaining about 4000 sheets of specimens during 77 hours of actual collecting.

He took a wide interest in general botanical problems and attended the International Botanical Congresses at Ithaca (1926) and Cambridge (1930) as an official delegate.

Among recent papers by Dr. Malte are " Commercial Bent Grasses (Agrostis) in Canada " (Ann. Rep. Nat. Mus. Canada, 1926, 105–126 : 1928), and "The so-called Agropyron caninum of North America " (l.c. 1930, 25–27 : 1932).

The Medicinal and Poisonous Plants of Southern Africa.*—This book should be of special interest, not only to botanists, but to workers in other spheres who are in any way connected with Southern Africa and its flora. Although there are several well-known works relating to the systematic botany of Southern Africa, detailed works on the economic uses of indigenous plants are lamentably few and far between. This renders the appearance of the present work all the more gratifying.

The literature relating to both medicinal and poisonous plants in South Africa is very scattered. Many of the older papers have long been out of print and existing copies are difficult of access to most workers. Consequently the need of a good reference book, incorporating both the old and the new, has long been felt. The new volume should completely fill this gap, for the amount of information contained therein, derived from most varied sources, is remarkable. The authors have made a diligent search and apparently nothing of any consequence has escaped their attention. In addition to the results and observations of other workers the researches of the authors themselves, carried out in the Pharmacology Department of the University of the Witwatersrand, are incorporated and supply much that is interesting and new concerning the properties of native medicinal plants.

---

*By J. Mitchell Watt and M. G. Breyer-Brandwijk. E. & S. Livingstone, 16–17, Teviot Place, Edinburgh, 1932. Pp. cxxviii + 314, illustrations 32. Price 25*s*. net.

The arrangement of the subject matter in the volume is excellent. The species appear under their respective families and these are arranged according to the system of Harms, which is the system adopted in other important South African botanical works. In the list of contents with which the volume opens the important properties of the more outstanding species are indicated. Detailed indexes are incorporated, consisting of separate indexes of English, Afrikaans, and native names, and of active principles. These are a valuable feature, particularly in view of the wide scope of the book ; and the space they occupy, eighty-eight pages out of a total of three hundred and fourteen, is not to be grudged. Full references to literature are given at the end of each family. In addition an appendix at the end of the volume contains a list of the larger and more general works consulted. Several photographs and coloured illustrations are included, many of which are reproduced from the useful South African Government publications relating to poisonous plants, particularly those concerned with the poisoning of live-stock.

A feature of the book which should render it of use in countries other than South Africa is the fact that many of the species dealt with occur commonly in other parts of the world. Some of the better known of these are :—*Abrus precatorius* L., *Agave americana* L., *Argemone mexicana* L., *Anacardium occidentale* L., *Cannabis sativa* L., *Carica Papaya* L., *Entada scandens* Bth., *Jatropha curcas* L., *Melia azedarach* L., and species of *Acacia, Datura, Eucalyptus, Euphorbia, Gloriosa, Solanum, Tephrosia* and *Xanthium.*

In view of the large amount of work that has been, and is being, carried out in South Africa on poisonous plants, particularly in the veterinary field, the appearance of a work of this sort is very appropriate. In the preface the authors state their aim has been " to give all the available information on the medicinal uses, chemical composition, pharmacological effects, and human and veterinary toxicology of the flora of Southern Africa." They are to be congratulated in having so successfully accomplished their difficult task.

F. N. H.

Printed under the authority of HIS MAJESTY'S STATIONERY OFFICE,
By The South Essex Recorders, Ltd., High Road, Ilford.

(722) Wt. 92/33 925 11/33 S.E.R. Ltd. Gp. 9.

BULLETIN OF MISCELLANEOUS
INFORMATION No. 10 1933
ROYAL BOTANIC GARDENS, KEW

LVIII—AGAVE AMANIENSIS: A NEW FORM OF FIBRE-PRODUCING AGAVE FROM AMANI.

Mr. W. Nowell, Director of the East African Agricultural Research Station, Amani, recently drew the attention of Kew to an *Agave* in cultivation at Amani under the name *A. Lespinassei* Trelease. Mr. Nowell pointed out, however, that it did not agree with the original description of that species and specimens were accordingly sent to Professor Trelease, who considers it to be an undescribed form belonging to the *Zapupe* group. As it is possible that it may be of importance as a fibre-producing plant, it seems desirable to publish the following description, drawn up by Mr. Nowell and Professor Trelease, together with a photograph of the plant at Amani and notes on its history and fibre-producing qualities, kindly supplied by Mr. Nowell.

The taxonomic status and interrelationship of the various forms of cultivated Agaves are a matter of opinion, pending a genetical investigation of the group: meanwhile it seems convenient to follow previous practice in giving this new form specific rank under the name *Agave amaniensis*.

Agave amaniensis *Trelease et Nowell*, sp. nov.; inter species gregis *Zapupe* foliorum marginibus inermibus spinis terminalibus basi conspicue aureo-zonatis distinguitur.

Habit erect, acaulescent, finally suckering rather freely. *Leaves* ensiform, rigid, leathery, ascending except the short basal ones which turn down, markedly glaucous on both sides ("greyish blue-green," Ridgeway, Pl. 48), giving a slatey-blue appearance from a distance, ground colour "deep, dull yellow-green" (Ridgeway, Pl. 32), length 140–160 (? 200) cm., width, at base 16 cm., at waist 10 cm., blade 15 cm., concave with margins incurved near the tip and nearly meeting below insertion of terminal spine; margins entire or a few rudimentary spines near base; translucent marginal line barely visible; terminal spine "taupe brown" (Ridgeway, Pl. 44) minutely pitted, slightly spirally curved, 15 mm. long, 4 mm. diam. at base, hollowed on the upper side to a shallow triangular trough about 5 mm. long, slightly (about 5 mm.) decurrent, surrounded at the base by a conspicuous greenish-yellow border 2 mm. wide. Flowers and fruit unknown.

Cultivated (under the name *A. Lespinassei* Trelease) at the East African Agricultural Research Station, Amani, Tanganyika Territory. *Greenway* 2994 (type, in the U.S.A. National Herbarium).

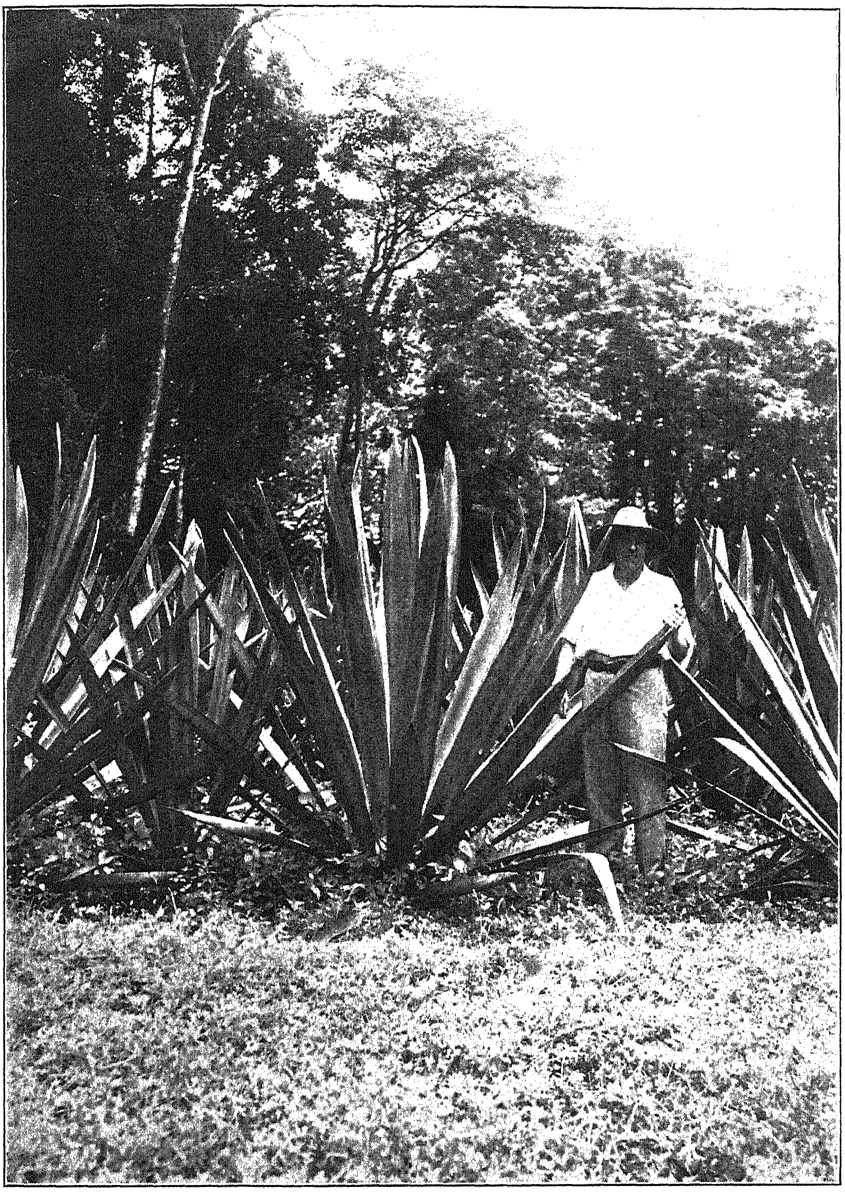
HISTORY AND PROPERTIES OF A. AMANIENSIS.

W. Nowell.

Although effort to trace the history of *Agave amaniensis* still continues its origin seems likely to remain obscure. The examples at present in cultivation are derived from a small group found almost buried in secondary growth of trees and shrubs in an abandoned section of the Amani Station near Sigi. My attention was first called to the length of leaf of these plants in comparison with ordinary sisal by Mr. F. M. Rogers, who as Head Gardener had charge of the Amani plantations for several years previous to reorganisation in 1927. Associated with the plants was a label of unknown date bearing the name *Agave Lespinassei*. With this species, as described by Professor Trelease, the plant definitely fails to agree, though it is to be noted that specimens of typical *Lespinassei* preserved in the Amani Herbarium from German times show that the species was once in cultivation at Amani. No living examples of it are now to be found. Information kindly supplied by Dr. K. Braun indicates that *A. Lespinassei* was introduced in January 1909 and again in May 1911, in both cases through the Botanic Garden at Berlin-Dahlem. To the record of the second introduction is attached the note " Zapupe de Tepezintla, Tampico." *Agave Zapupe* was also grown, from bulbils received from Professor Trelease in June 1909. The herbarium specimens of the last-mentioned species likewise agree with the original description and exhibit definite differences from the plant under notice. Dr. Braun informs me that the different *Agave* species were planted out near to the great rock Ilsenstein, which forms a prominent landmark on the Amani hillside, and a native foreman, who has been continuously employed here, adds the information that all were dug up at some unspecified date and transported to Kihuhui plantation where they apparently cannot be traced at the present time.

Neither the original plants of *A. amaniensis* nor their progeny have been observed to pole, and propagation so far has depended on the transplanting of suckers, which are produced with considerable freedom after two years of growth. Observations of the species have mainly been made on a plot established in sandy soil in an open situation at Sigi (1400 feet) planted in December 1929. Other plots, now two years old, each established from about 400 suckers, are in existence on commercial estates at Magunga, near Korogwe (Messrs. Bird & Co.) and Amboni, near Tanga (Amboni Estates Ltd.). A few plants have been grown at Amani at an elevation of about 2750 feet. In all cases the vegetative development is markedly superior to that of *Agave sisalana* as regards both rapidity of growth and size of leaf attained. It seems certain that a gain of six to twelve months will be generally made in the date of the first cutting, and appearances suggest that an increased rate of production will be maintained. Mature leaves on the three-year-old plot at Sigi have an average

PLATE XVII



Agave amaniensis growing at Amani. Planted December, 1929.
Photographed September, 1932.

length of 150 cm. It remains to be seen how long the plants will take to pole.

No reliable figures of comparative weights of fibre produced are yet available but the indications are that the percentage of fibre will be somewhat lower than that of sisal. The number of fibres per leaf on the other hand is much greater. Sample counts made on cross sections of the leaves have given the figures 2210 and 1080 respectively. It follows that the fibre of *Agave amaniensis* is much the finer and this is immediately evident on comparing extracted samples. The average tensile strength of sisal fibres is greater owing to their much greater thickness but when calculated to equal cross sectional area the fibre of *A. amaniensis* has about 1½ times the tensile strength of sisal. It has a very notable advantage in length; fibre from Sigi runs from four to five and half feet. The brushed fibre is lustrous, white to creamy-white in colour, with a pleasant soft texture.

The characters described above are in very close accord with those claimed for the Zapupe group of Mexican Agaves in articles which went the round of the world's journals interested in tropical agriculture during 1906 and the two following years. *A. amaniensis*, while it reproduces the desirable characters claimed for the Zapupe group, has a great practical advantage in the complete absence of the strong marginal spines characteristic of *A. Lespinassei* and its associates.

LIX—TROPICAL AFRICAN PLANTS: XI.*

Rinorea Dawei (*Sprague*) *Bullock*, comb. nov. [Violaceae]; *Alsodeia Dawei* Sprague in Journ. Linn. Soc., Bot. **37,** 497 (1906).

Psilotrichum filiforme *E. A. Bruce*, sp. nov. [Amaranthaceae]; affinis *P. gracilento* C. B. Cl. sed gracilior et ramosissima, inflorescentiis brevioribus, floribus minoribus differt.

Herba gracilis, erecta, ramosissima, glabra, 15–25 cm. alta; caules maturi saepe prominenter sulcati, internodiis inferne brevibus superne elongatis (1–4 cm. longis), ramulis brevissimis foliatis in axillis foliorum dispositis. *Folia* lineari-filiformia, 1–2·5 cm. longa. *Inflorescentia* spicata, spicis plerumque terminalibus usque ad 1 cm. longis sed plerumque minoribus, pedunculis gracilibus usque ad 5 cm. longis. *Bracteae* lanceolatae, valde persistentes, demum patentes et leviter arcuatae, circiter 1 mm. longae. *Flores* solitarii, pedicellis bibracteolatis, bracteolis linearibus minutis. *Perianthii* segmenta 5, alba, oblongo-lanceolata, circiter 1 mm. longa, apice subacuta. *Stamina* 5, antheris pro rata magnis, filamentis brevibus complanatis basin versus latioribus; staminodia absunt. *Ovarium* ovoideum, stylo simplice lineari.

TANGANYIKA TERRITORY: Tabora District; Shinyanga, 3600 ft., in grey sandy soil in seasonal marsh, *B. D. Burtt* 2440 (type). Old

---

*Continued from *K.B.* 1933, 151.

Shinyanga, Seke Road, 3800 ft., in a marshy *Lannea* glade with *Microchloa indica*, *B. D. Burtt* 3724. Mwanza District; Mwanza, *R. L. Davis* 235.

Buchnerodendron stipulatum (*Oliv.*) *Bullock*, comb. nov. [Flacourtiaceae];—*Oncoba stipulata* Oliv. in Trans. Linn. Soc., Bot. **29**, 31 (1872).

Euphorbia imbricata *E. A. Bruce*, sp. nov. [Euphorbiaceae]; affinis *E. Petitianae* A. Rich. sed margine foliorum integro leviter involuto differt.

Herba perennis, erecta, glabra, radice lignosa, caulibus costatis circiter 2 mm. crassis. *Folia* alterna, inferiora remota, superiora imbricata, sessilia, glabra, 0·8–1·3 cm. longa, 0·4–0·8 cm. lata, oblanceolata, apice obtusa sed mucronata, basi rotundata vel late cuneata, costa media prominente, margine integro leviter involuto. *Stipulae* non visae. *Umbella* terminalis, circiter 3 cm. diametro, radiis 4 bifidis circiter 3·5 cm. longis glabris. *Bracteae* involucri 2, orbiculatae, purpureo-tinctae, apice truncatae vel leviter emarginatae, valde apiculatae. *Glandulae* involucri 4, intra ciliatae, lobis 4 lanceolatis margine dentato alternis. *Capsula* non visa.

TANGANYIKA TERRITORY: Rungwe District; Elton Plateau, 9000 ft., flower greenish with purple tinge, found in grassland, *R. M. Davies* E. 17 (type).

Zimmermannia ovata *E. A. Bruce*, sp. nov. [Euphorbiaceae]; affinis *Z. capilliped* Pax sed foliis minoribus basi rotundatis differt.

Frutex parvus, gracilis, ramulis junioribus viridibus glabris, maturis pallide ferrugineis leviter lenticellatis. *Folia* petiolata, petiolis 0·5–1·0 cm. longis glabris: lamina ovata, membranacea, glabra, 4–8 cm. longa, 2·5–5·0 cm. lata, apice acuta vel sensim acuminata, basi late rotundata, margine integra: nervi laterales utrinsecus circiter 6, ascendentes, arcuati. *Stipulae* mox deciduae, foliaceae, glabrae, late ovatae, circiter 1 cm. longae et latae, basi cordatae, apice acutae vel breviter acuminatae. *Flores* monoici, rosei, solitarii vel fasciculati in axillis foliorum dispositi; flores ♂ pedicellati, pedicellis 5 mm. longis, sepalis 5 valde imbricatis 4 mm. longis orbicularibus apice obtusis margine minute ciliatis, staminibus 5, antheris magnis ellipsoideis sessilibus vel subsessilibus e disco ortis et ovarii rudimentum circumdantibus, disco subintegro verruculoso crasso ultra antheras producto. *Flores* ♀ longe pedicellati, pedicellis circiter 3 cm. longis, sepalis 5 imbricatis oblongo-obovatis apice rotundatis circiter 1·3 cm. longis et 1·0 cm. latis, ovario globoso-ovoideo circiter 5 mm. longo glabro, stylis 3 liberis ascendentibus integris, stigmatibus biglobosis, disco tenue et plano circiter 7 mm. diametro margine integro vel leviter undulato. *Capsula* rubro-brunnea, purpurea, in valvas 6, circiter 1·3 cm. longas fissa. *Semina* fusca, reniformia, circiter 6 mm. longa, foveolata.

KENYA COLONY: Teita Hills, 4500 ft., in the undergrowth of Ngangao mist-forest, *Gardner* 2909 (type)!

This genus has previously only been recorded from Tanganyika Territory in the vicinity of Amani and is represented by *Z. capillipes* Pax. The discovery of a second species in the Teita Hills in South-East Kenya is therefore of interest.

Crotalaria (Simplicifoliae) vialis *Milne-Redhead,* sp. nov. [Papilionaceae]; a *C. anthyllopsi* Welw. ex Bak. foliis supra glabris, floribus paucioribus majoribus, vexillis alisque saturate caeruleis differt.

Herba annua, circiter 25 cm. alta, ramosa, ramis erectis adscendentibus vel decumbentibus usque 30 cm. longis. *Caules* teretes vel leviter sulcati, leviter ferrugineo-hirsuti, vel apicem versus densius. *Folia* unifoliolata, petiolata, ovata vel lanceolata, obtusa vel subacuta, minute apiculata, basi rotundata, usque 6 cm. longa et 2·5 cm. lata vel 7 cm. longa et 2 cm. lata, supra glabra, costa leviter sulcata, subtus conspicue adpresse hirsuta, costa ferruginea conspicua; petioli usque 8 mm. longi, densiuscule ferrugineo-hirsuti; stipulae filiformes, usque 5 mm. longae, hirsutae, persistentes. *Racemi* terminales, usque 12-flori, breviusculi, usque 3 cm. longi; bracteae stipulis similes, usque 3 mm. longae; pedicelli usque 9 mm. longi cum rhachi dense hirsuti; bracteolae bracteis similes. *Calyx* extra dense hirsutus, intus glaber; tubus brevissimus, circiter 1 mm. longus; segmenta postica oblongo-lanceolata, acuta, 1·5 mm. lata, 7 mm. longa; lateralia lanceolata, subulata, basi 1·5 mm. lata; antica lineari-subulata, breviuscula. *Vexillum* depresso-orbiculare, circiter 11 mm. altum ungue incluso, et 13 mm. latum, breviter unguiculatum, ungue recurvato margine ciliato, apice emarginatum, glabrum, caeruleum; alae obovato-oblongae, circiter 11 mm. longae et 5 mm. latae, apice rotundatae, basi curvatae, unguiculatae, glabrae, caeruleae; carina dorso rotundata, rostrata, 1 cm. diametro, basin versus breviter lobata, unguiculata, flavo-albida. *Stamina fertilia* antheris 1·5 mm. longis praedita; stamina redacta similia sed antheris minimis. *Ovarium* stipitatum, 10–13-ovulatum, lineari-oblongum, circiter 3 mm. longum, margine postico hirsutum, stipite vix 2 mm. longo; stylus 11 mm. longus, apicem versus postice minute pubescens. *Legumen* immaturum oblongo-ovoideum, sessile, 1·4 cm. longum, 0·8 cm. diametro, dense pilosum.

TANGANYIKA TERRITORY: Iringa District: in moist sandy furrows of present and recent cultivation, and also on damp roadsides, at Iringa, 5300 ft., 17 March 1932, *Lynes* I.g. 223 (type); weed, flowers deep violet-blue with straw-coloured calyces. Mbeya District: common at Ipata, 4000 ft., 10 April 1932, *R. M. Davies* 573; herb, yellow flowers.

Chlamydocarya rostrata *Bullock,* sp. nov. [Icacinaceae]; a *C. Thomsoniana* Baill. foliis maturis glabris abrupte acuminatis, corolla fructifera longiore minus dense pubescente differt.

Frutex alte scandens; rami volubiles, ramulis primum dense adpresse ferrugineo-strigoso-pubescentibus demum glabrescentibus.

Folia matura utrinque glabra, integra, anguste obovata vel elliptica, vel obovato-oblanceolata, apice obtuse 2–2·5 cm. longe caudato-acuminata, basin versus cuneatim angustata, sed obtusa, usque 18·5 cm. longa et 7 cm. lata, nervis lateralibus arcuatis subtus prominentibus utrinque circiter 9; petioli circiter 5 mm. longi, primum cum ramulis pubescentes, mox glabri. *Inflorescentia* 2 cm. longa, spicata; flores masculi non visi; flores feminei 4-meri. *Calyx* fere ad basin lobatus, lobis ovatis subacutis circiter 1 mm. longis. *Corolla* statu florifero non visa, sed in statu fructifero valde accrescens, calyptriformis, apice in caudam 6 cm. longam producta, extra retrorse vel patenter strigoso-setosa. *Fructus* breviter stipitatus, obovatus, apice in caudam 1–1·5 cm. longam productus, in toto 3 cm. longus, 1·5 cm. latus, lateraliter compressus, in sectione ellipticus, strigoso-setosus, profunde rugosus, costis marginalibus validis.

SOUTHERN NIGERIA: Mamfe, a forest climber, Jan. 1932 *Maitland* 1167.

This species is readily distinguished from its congeners by the very long tail of the fruiting corolla. From its nearest ally, *C. Thomsoniana* Baill., it is distinguished by its glabrous, abruptly acuminate leaves, which are inclined to be broadest towards the apex, cuneately narrowed to the obtuse base, and somewhat larger than in that species. The fruiting corolla is also less densely hairy, and lacks the expanded rim immediately above the adnate portion of the fruit which appears to characterise *C. Thomsoniana*.

Loranthus ngurukizi *E. A. Bruce*, sp. nov. [Loranthaceae]: affinis *L. Acaciae* Zucc. (§ *Tapinostemma*) sed floribus majoribus nec versus basin gibbosis, calyce truncato differt.

Caules juniores rubro-fusci, crassi, glabri, lenticellis elongatis cinereis prominentibus adspersis, maturi lignosi, cortice glabro griseo rugoso conspicue lenticellato. *Folia* opposita vel subopposita, breviter petiolata, petiolo glauco 2 mm. longo, oblongo-lanceolata usque obovata, apice obtusa vel rotundata, basi cuneata, 2–4 cm. longa, 1–2·3 cm. lata, coriacea, glauca, glabra, e basi 3-nervata, nervis sub-parallelibus. *Inflorescentia* umbellata, axillaris, pauciflora, pedicellis 5 mm. longis; bracteae parvae, disciformes, unilateraliter ampliatae. *Calyx* (receptaculo incluso) cupuliformis vel suburceolatus, 4–5 mm. longus, glaber, limbo truncato vel undulato. *Corolla* gamopetala, profunde coccinea, circiter 5·5 cm. longa, tubo 2·0–3·0 cm. longo nec gibboso; lobi 5, utrinsecus basin versus cristis 5 descendentibus ad basin filamentorum adnatis, cristis lanceolatis circiter 1·5 mm. longis; loborum apices liberi circiter 2 cm. longi, lineares, subacuti. *Filamenta* circiter 4 cm. longa, partibus tribus inferioribus adnatis. *Antherae* circiter 1 cm. longae, lineares. *Stylus* circiter 5·5 cm. longus, cylindricus, glaber, stigmate capitato.

TANGANYIKA TERRITORY. Manyoni Kopje, 4200 ft., parasitic on *Commiphora kyimbilensis* Engl., *B. D. Burtt* 3419 (type).

Vernacular name: *Ngurukizi*.

This is a remarkable plant, the young stem of which resembles the aerial root of an epiphytic orchid; the flowers are deep pink in colour tipped with greenish-blue. It differs from the other two species in the section by the absence of the gibbous sacs at the base of the corolla-lobes.

Otiophora caerulea (*Hiern*) *Bullock*, comb. nov. [Rubiaceae]. *Pentanisia caerulea* Hiern, Cat. Welw. Afr. Pl. **2**, 471 (1898).

A re-examination of a specimen of the type-number of this plant shows that the ovules are erect, not pendulous as in the genus *Pentanisia* Harv. This, coupled with the presence of a very narrow, almost filiform corolla-tube, exserted stamens with slender, comparatively long filaments, and the tendency to enlargement of one or more of the calyx-teeth, is ample justification for transferring it to *Otiophora* Zucc. The following specimens are incorporated in the Kew herbarium:—

TANGANYIKA TERRITORY: Iringa Province; Lower Plateau north of Lake Nyassa, *Thomson*! Kyimbila district; Bundali, 18 May, 1912, *Stolz* 1280! Bulambya, 15 March 1913, *Stolz* 1947! Mbosi, about 5400 ft., Nov. 1928, *Haarer* 1592! Njombe, 6000 ft., Oct. 1931, *Staples* 211! Njombe, 10 Dec. 1931, *Lynes* D.p. 114!

NYASALAND: Nyika Plateau, 6000–7000 ft., July 1896, *Whyte* 193! Between Mpata and the commencement of the Tanganyika Plateau, 2000–3000 ft., July 1896, *Whyte*! Masuku Plateau, 6500–7000 ft., July 1896, *Whyte*!

NORTHERN RHODESIA: Mwinilunga, 4500–5000 ft., Jan.-March, 1929, *Marks* 77!

ANGOLA: R. Monino, along the road to Quilengues, Huilla, Feb. 1860, *Welwitsch* 5314! (type in Brit. Mus. Herb., dupl. in Kew Herb.). Benguella; between R. Cutato and R. Cuchi, as far as Munongue, *Gossweiler* 2437! between rivulets Cuanza and Cului, Dec., *Gossweiler* 2932!

Pygmaeothamnus concrescens *Bullock*, sp. nov. [Rubiaceae]; a *P. Zeyheri* (Sond.) Robyns foliis oppositis, floribus multo majoribus facile distinguitur.

Suffrutex nanus, erectus, circiter 15–25 cm. altus; caules annui, simplices, lignosi, glabri, e rhizomate subterraneo orti, internodiis usque ad 7 cm. attingentibus sed plerumque circiter 2–5 cm. longis. *Stipulae* intrapetiolares intus villosae, ceterum glabrae, basibus latis truncatis vaginato-connatis, longe caudato-subulatae caudis acutis erectis usque 6·5 mm. attingentibus. *Folia* opposita, glaberrima, leviter discoloria (subtus glauca?), elliptica vel anguste obovata, apice breviter et abrupte acuminata, vel fere rotundata et breviter apiculata, basi in petiolum circiter 1 cm. longum sensim angustata, lamina circiter 8–10 cm. longa et 3–5 cm. lata, inferne valde redacta, costa et nervis lateralibus (utrinque circiter 5) satis prominentibus, venis reticulatis. *Flores* albi, in cymas dichasiales axillares pedunculatas circiter 10–15-floras dispositi; pedunculus sub anthesin

2 cm. longus, satis crassus, statu fructifero usque 5 cm. longus et basin versus caulis coalitus; pedicelli crassi, 3–6 mm. longi; bracteae et bracteolae lineares, minutae. *Calyx* glaber, campanulatus, tubo (ovario incluso) 4·5 mm. longo, apice 3 mm. diametro, lobis 5 anguste triangularibus 4 mm. longis basi 2 mm. latis apice acutis. *Corollae lobi* 5, sub anthesin reflexi, oblongi, subacuti, 5 mm. longi, 2 mm. lati, glabri; tubus subconico-cylindricus, 5 mm. longus, usque 3·5 mm. diametro, intus infra faucem pilis villosis reflexis annulatus. *Filamenta* brevissima. *Antherae* alabastro circa stigma cohaerentes, sub anthesin liberae, lanceolatae, apice acutae, basi sagittatae, 3 mm. longae et 1·5 mm. latae, margine hyalinae. *Ovarium* 2-loculare; ovula in loculis solitaria, pendula; stylus 7 mm. longus, apicem versus leviter angustatus; stigma capitatum, 2 mm. longum et medio 2 mm. diametro, apice bifidum. *Fructus* drupacei, carnosi, plerumque abortu uniloculares, subglobosi, circiter 2 cm. diametro.

TANGANYIKA TERRITORY: Iringa Province; Njombe, a very common small shrub, with white flowers, 10 Dec. 1931 (fl.), *Lynes* D.p. 108 (type); 6000 ft., a woody herb 1 ft. high, with leathery leaves, common in patches in grassland, Aug. 1931 (fr.) *Mr. and Mrs. H. E. Hornby* 65.

This peculiar genus of undershrubs, established by Dr. Robyns* to include four species (with several varieties), is very closely allied to *Canthium* Lam. (*Plectronia* Auctt., non Linn.).

A figure of this species, and a general discussion of the genus as a whole, is being prepared for early publication in Hooker's *Icones Plantarum*.

Tapiphyllum floribundum *Bullock*, sp. nov. [Rubiaceae]; *T. obtusifolio* (K. Schum.) Robyns affine, ramis stricte angulo recto patentibus persistenter molliter tomentellis, internodiis longioribus, pedunculo brevissimo sed distincto, floribus numerosioribus majoribus differt; a *T. velutino* Robyns foliis haud basi cordatis, floribus multo numerosioribus haud fasciculatis facile distinguitur.

Frutex erectus, usque 4 m. altus, ramosissimus, omnino molliter tomentoso-pubescens; rami angulo recto patentes, satis crassi, laeves, indumento molliter albido-tomentello persistente vestiti, cortice maturo haud rugoso sed demum brunneo-rubro et longitudinaliter fisso; ramuli hornotini dense flavo-tomentosi, internodiis 1–3 circiter 3·5–6 cm. longis praediti. *Stipulae juniores* in vaginam 3 mm. longam connatae, intus dense molliterque albido-villosae, extra flavo-tomentosae, in appendicem lineari-filiformem usque 7·5 mm. longem desinentes. *Folia* opposita, elliptica usque obovata, apice rotundata usque subacuta, basi rotundata vel subtruncata, haud cordata, usque 4 cm. longa et 3 cm. lata (juniora), ad margines undulata, utrinque dense flavo-piloso-tomentosa, subtus pallidiora, nervis lateralibus utrinsecus circiter 8 satis prominentibus; petioli tomentosi, circiter 4–7 mm. longi. *Flores* ad nodos ramulorum

---

*Robyns, "Tent. Monogr. Vangueriae" in Bull. Jard. Bot. Brux. **11**, 29 (1928).

annotinorum in cymas tomentosas axillares oppositas globosas circiter 15–20-floras congesti; pedunculi circiter 5 mm. longi, apice bracteis duabus oppositis ovatis 9 mm. longis et 5 mm. latis apice acutis praediti; pedicelli obsoleti vel usque 2 mm. longi; bracteolae bracteis similes sed minores. *Calyx* (ovario incluso) 9 mm. longus, fere ad discum 5-lobatus, lobis erectis linearibus vel lineari-lanceolatis 6 mm. longis et 1 mm. latis, pilis satis longis dense tomentoso-indutus. *Corolla* alabastro apice apiculata, acuta, 8 mm. longa, extra pilosa, sub anthesin tubo cylindrico 4 mm. longo intus pilis villosis annulato, lobis patentibus oblongo-ovatis 3 mm. longis (appendicibus exclusis) et 1·75 mm. latis intus glabris, appendicibus loborum lineari-subulatis longe pilosis 2 mm. longis. *Antherae* inter lobos exsertae, oblongae, 1·25 mm. longae, basi cordatae, filamentis brevissimis fauce insertis. *Stylus* 5 mm. longus, satis crassus, apicem versus gracilescens, stigmate coroniformi-cylindrico fere 1 mm. longo 5-sulcato apice 5-lobulato. *Discus* annularis, carnosus, 1·5 mm. diametro. *Ovarium* hemisphaericum, 2·5 mm. diametro, 5-loculare. *Fructus* non visi.

TANGANYIKA TERRITORY: Manyoni Kopje, 4200 ft., a shrub to 12 ft. high in deciduous thicket and dry *Brachystegia-Berlinia* woodland, 28 Dec. 1931, *B. D. Burtt* 3458 (type); without exact locality, Iringa District, 15 Dec. 1927, *B. D. Burtt* 709; Kondoa District; Swagaswaga, about 4500 ft., a pubescent shrub of the *Berlinia* savannah on reddish sandy soils, 21 Dec. 1927, *B. D. Burtt* 875. Kiringi name:—*Mdedu.*

The characteristic, long persistent indumentum of the otherwise smooth branchlets of this species at once distinguishes it from its nearest ally, *T. obtusifolium* (K. Schum.) Robyns. The internodes of the latter are, however, very short compared with those of the present plant, and they rapidly become almost glabrous. Among more minute characters the very long appendix of the corolla-lobes of *T. floribundum* may be mentioned. These are not equalled in any of the shrubby species of the genus, and scarcely exceeded among the herbaceous species. The very long calyx-lobes are also unique among the shrubby species.

Lobelia Burttii *E. A. Bruce*, sp. nov.* [Lobeliaceae]; affinis *L. Bequaertii* De Wild. sed lobis corollae erectis nec reflexis apice glabris, bracteis angustioribus differt.

Planta 0·5–2·0 m. alta; rosula foliorum stipitata. *Folia* 14–25 cm. longa, 3–5 cm. lata, sessilia, lineari-lanceolata vel ovato-lanceoalta, infra medium latissima, apicem versus sensim angustata, apice rotundata vel acuta, breviter apiculata, utrinque glabra, margine integro ciliato; nervi laterales sub angulo 45° abeuntes, infra inconspicui, supra manifesti. *Bracteae* floribus duplo longiores, 6–9 cm. longae, 2·5–3·5 cm. latae, ovatae, infra medium latissimae, acutae vel sensim acuminatae, margine integro parce ciliato, utrinque glabrae. *Pedicelli* glabri, circiter 1 cm. longi vel minus, basin versus bracteolis 2 squamiformibus circiter 1·5 mm. longis instructi. *Calycis tubus* campanulatus, glaber, alabastro 0·1–0·8 cm. longus, 0·4–0·6 cm. latus; lobi triangulares vel anguste lanceolati, 0·7–1·2 cm. longi, basi 0·2–0·4 cm. lati, apice rotundati vel subacuti, minute apiculati, utrinque glabri, marginibus parce ciliati, fructu lobis usque 1·5 cm. longis 0·5 cm. latis, tubo usque 1·5 cm. longo 1 cm. lato. *Corolla* circiter 3 cm. longa, violacea vel profunde caeruleo-lilacina, extra glabra, dorso fissa, lobis erectis, 2 lateralibus infra medium liberis, 3 media in parte superiore liberis, late linearibus acuminatis extus glabris intra in tertia media crispe pubescentibus aliter glabris. *Filamenta* circiter 2 cm. longa, glabra, infra medium libera; antherae circiter 0·9 cm. longae.

---

*A figure of this species will appear in a forthcoming number of the Kew Bulletin.

TANGANYIKA TERRITORY: Mbulu District; Mt. Hanang, 11,000 ft., in the mossy shade of the lava cliffs on the west face of the crater just below the summit of the mountain, *B. D. Burtt* 4049 (type). Arusha District; Mt. Meru, south side of cone, 12,000–13,000 ft., among *Helichrysum Newii*, *Erica*, *Philippia* and *Alchemilla*, especially in ravines, *B. D. Burtt* 4128. Mbulu District; Ngoro-ngoro, Mt. Loolmalassin, 11,000 ft., in a small marsh on south side of the mountain, among *Erica*, *Philippia* etc., *B. D. Burtt* 4214.

Craterostigma lindernioides *E. A. Bruce*, sp. nov. [Scrophulariaceae]; omnibus congeneribus gracilior, inflorescentia laxiore pedicellis longioribus differt.

Herba annua, erecta, glabra, haud ramosa, circiter 12 cm. alta; caules sulcati, complanati, leviter torti, internodiis 1–2 cm. longis. *Folia* opposita, sessilia, linearia, circiter 1 cm. longa, apice acuta. *Flores* pauci, axillares, rubri, flavido- atque caeruleo-notati, pedicellis gracilibus circiter 1 cm. longis. *Calyx* 5-dentatus, plicatus, lobis lanceolatis ciliatis circiter 1 mm. longis, tubo anguste campanulato circiter 2·5 mm. longo. *Corollae* tubus brevis, labio superiore erecto oblongo-ovato 3 mm. longo apice late rotundato, labio inferiore 3-lobato plus minusve patente lobis apice rotundatis. *Stamina* 4, inferioribus 2 corollae fauce insertis, filamentis circiter 2 mm. longis basi gibbosis, superioribus 2 in tubo insertis, antheris monothecis cohaerentibus. *Ovarium* anguste elongato-ovoideum, glabrum, stylo lineari simplici circiter 4 mm. longo, stigmate complanato elliptico. *Capsula* anguste ovoideum, apice acuta, leviter arcuata.

TANGANYIKA TERRITORY: Manyoni District; Kazikazi, 4100 ft., along the wet margin of a seasonal pond, among *Eriocaulon elegantulum*, *B. D. Burtt* 3612 (type).

In its habit this plant resembles *Lindernia*, but the gibbous swellings at the base of the filaments place it in the genus *Craterostigma*.

Rhamphicarpa filicalyx *E. A. Bruce*, sp. nov. [Scrophulariaceae]; ab omnibus speciebus tropicis africanis calycis lobis longe filiformibus valde distincta.

Herba erecta, 25–40 cm. alta: caulis simplex vel 10–15 cm. supra basin leviter ramosus, plus minusve glabrescens. *Folia* linearia usque lineari-filiformia, sessilia, apice acuta vel subacuta, 2–6 cm. longa, 0·1–0·2 cm. lata, integra vel raro basin versus lineari-lobulata, infra glabra, supra scabrida. *Flores* solitarii, supra axillas foliorum orti. *Calycis tubus* cupuliformis, 10-striatus, circiter 3 mm. longus, pilis paucis strigosis instructus: lobi 5, longe filiformes, 1·5–3·0 cm. longi, apice acuti, scabridi. *Corolla* alba, demum caerulea; tubus anguste cylindricus, 1·5–2·5 cm. longus, extra glanduloso-pubescens, intus striguloso-pubescens, lobis 4 obovatis apice rotundatis suberectis vel leviter patentibus glabris circiter 1 cm. longis 0·5 cm. latis. *Stamina* 4, infra medium corollae tubi inserta, filamentis circiter 2 mm. longis, dense pubescentibus, antheris aequilongis monothecis lanceolatis apice acutis. *Ovarium* ovoideum, valde obliquum, glabrum, apice in rostrum longum productum, stylis circiter 7 mm. longis apicem versus hirsutis alioqui glabris. *Fructus* oblique ovoideus, rostratus, circiter 7 mm. longus, 9 mm. latus, glaber. *Semina* numerosa, glabra, ovoidea usque cylindrica, rugosa.

TANGANYIKA TERRITORY: Iringa District; in cattle pastures in the plain of the Little Ruaha River, *Lynes* P.g. 70 (type). Tabora District; Tabora, fairly common, *Durham* s.n.

Utricularia appendiculata *E. A. Bruce*, sp. nov. [Lentibulariaceae]; affinis *U. striatulatae* Smith, sed statura majore scapo implicato, bracteis medifixis differt.

Herba terrestris, gracilis, glabra, scapis implicatis usque ad 30 cm. longis, stolonibus paucis e basi scapo ortis. *Folia* non visa. *Flores* 2–5, remoti, pedicellis circiter 2 mm. longis. *Bracteae* medifixae, circiter 2·5 mm. longae, lanceolatae, acutae. *Calycis* lobi inaequales, inferior ovato-lanceolatus obtusus, superior ovato-orbicularis, ambo circiter 3 mm. longi. *Corolla* pallido-flava, palato pallido-purpureo striato nec papilloso, labio superiore ovato-lanceolato acuto erecto, lobis calycis subaequali, labio inferiore ovato integro circiter 3 mm. longo calcari subparallelo. *Capsula* globosa.

TANGANYIKA TERRITORY: Bukoba District; Biharamulo road, 4000 ft., among *Sphagnum*, *Drosera* and *Eriocaulon*, *Haarer* 2056 (type): Lake Nabugabo, 3750 ft., in *Sphagnum* bog, *Eggeling* 960.

This species belongs to the group which has the bracts attached near the middle; it is also characterized by its twining stem.

Saintpaulia alba *E. A. Bruce*, sp. nov. [Gesneriaceae]; affinis *S. Goetzeanae* Engl. sed foliis majoribus crenatis pedunculo multifloro differt.

Caulis simplex, 3–6 cm. longus, leviter pubescens, demum glaber. *Folia* fusco-viridia, alterna, petiolata, petiolo 0·5–2·0 cm. longo leviter pubescente et parce strigoso ; lamina ovata usque oblonga, 5–10 cm. longa, 3·0–3·5 cm. lata, apice rotundata, basi rotundata vel cuneata supra pilis brevibus appressis obtecta, infra glabra praeter nervos paucos appresse pubescentes, margine crenato ; nervi laterales sub angulo fere 90° patentes, arcuati, utrinsecus circiter 12. *Cymae* multiflorae ; pedunculi axillares, 4–8 cm. longi, pilis ascendentibus ; pedicelli graciles, 0·5–1·0 cm. longi, pubescentes. *Calyx* fere ad basin 5-lobatus, lobis oblongis circiter 2 mm. longis extra pilis ascendentibus intus glabris. *Corollae* tubus albus, late campanulatus, circiter 5 mm. longus, 4 mm. latus, leviter longe pubescens, lobis ovatis apice rotundatis 2 superioribus circiter 2 mm. longis 2 inferioribus circiter 4 mm. longis. *Stamina* 2 basi corollae tubi inserta, filamentis glabris circiter 2 mm. longis, antheris magnis orbicularibus circiter 2 mm. longis cohaerentibus. *Ovarium* oblongo-ovoideum, circiter 2 mm. longum, dense pubescens, stylis glabris circiter 4 mm. longis.

TANGANYIKA TERRITORY: Morogoro District; Uluguru Mountains, Lupanga Mt., 6500–7000 ft., a spectacular white-flowered herb in the semi-shade of a tree-fern forest on a steep moss covered rock slope, *B. D. Burtt* 3470 (type) !

Streptocarpus hirsutissimus *E. A. Bruce*, sp. nov. [Gesneriaceae] ; affinis *S. hirtinervi* C. B. Cl. sed foliis integris, floribus majoribus differt.

Herba erecta, usque 50 cm. alta ; caulis simplex, circiter 1 cm. crassus, 20–30 cm. longus, pallide fuscus, pilis multicellulatis lucidis dense instructis. *Folia* caulis apicem versus 8–12-rosulata breviter petiolata, petiolo usque 1 cm. longo, pilis multicellulatis dense instructo ; lamina integra vel leviter undulata, oblanceolato-obovata, basi cuneata, apice subacuta, matura circiter 6 cm. longa, 2·5 cm. lata, juniora 1–3 cm. longa, supra dense hirsuta, subtus nervis valde prominentibus dense hirsutis pilis lucidis multilocellatis ; nervi laterales utrinsecus 12–14, ascendentes. *Pedunculus* 6–12 cm. longus, hirsutus, circiter 5-florus, pedicellis usque 1 cm. longis, fructu elongatis. *Calyx* ad basin lobatus, lobis lineari-lanceolatis 5–7 mm. longis extra praesertim apicem versus dense hirsutis, intus glabris. *Corolla* pallide violacea, 5–6 cm. longa, tubo cylindrico apicem versus leviter expanso pubescente circiter 6 cm. diametro, lobis rotundatis vel obovatis 1–1·5 cm. longis. *Stamina* medium versus tubi inserta, filamentis circiter 8 mm. longis apicem versus alatis breviter pubescentibus ; antherae rotundatae, basi anguste cordatae, 3 mm. latae. *Ovarium* dense pubescens, stylo pubescente. *Capsula* circiter 8 cm. longa, 3 mm. lata.

TANGANYIKA TERRITORY : Morogoro District, Uluguru Mountains, Lupanga Peak, 6000 ft., approximately, in the crevices of a vertical cliff face growing in wet moss and leaf litter in an exposed position, *B. D. Burtt* 3462 (type).

Disperma trachyphyllum *Bullock*, sp. nov. [Acanthaceae] ; a *D. parvifloro* C. B. Cl. foliis minoribus scabrido-pubescentibus vix acuminatis basi rotundatis, ramis subglabris vel puberulis haud setosis differt.

Suffrutex erectus, usque 1·5 m. altus, ramis quadrangularibus glabrescentibus vel leviter puberulis. *Folia* elliptica usque ovata, circiter 3·5–5·5 cm. longa et 2–3 cm. lata, apice obtusa vel subacuta, basi rotundata, supra scabrido-pubescentia, infra praesertim costa et nervis lateralibus prominentibus (utrinsecus 4–6) patenter pubescentia, crenato-dentata, petiolis pubescentibus usque 5 mm. longis. *Flores* in axillis glomerati, cymosi, bracteis et bracteolis oppositis basi connatis dense breviter pubescentibus ; bracteae oblongae vel lanceolato-ovatae, infimae circiter 1 cm. longae et 4·5 mm. latae ; bracteolae minores, lanceolatae. *Calyx* sub anthesin in toto 8 mm. longus, segmentis 2 anticis connatis parte apicali libera 2 mm. longa, segmentis 3 posticis fere usque ad basin liberis, omnibus longe ciliatis. *Corolla* alba, 1·3 cm. longa, tubo cylindrico 8 mm. longo. *Antherae* exsertae, 1·5 mm. longae. *Ovarium* oblongum, 2 mm. longum, 2-ovulatum ; stylus 8 mm. longus, leviter patenter pubescens, inaequaliter 2-fidus. *Capsulae* maturae non visae, sed juniores in calyce et bracteolis accrescentibus inclusae.

TANGANYIKA TERRITORY: Dodoma Province; Mpwapwa, 4000 ft., a common white-flowered subshrubby herb up to 4 ft. high, growing in a dark brown soil in the *Brachystegia-Combretum* association on stony hill slopes, 18 Aug. 1930, *Greenway* 2391.

Known locally as " Asbestos-bush," *Disperma trachyphyllum* forms impenetrable thickets.

Disperma crenatum (*Lindau*) *Milne-Redhead*, comb. nov. [Acanthaceae] ; *Hygrophila crenata* Lindau in Engl. Bot. Jahrb. **20**, 6 (1894) ; *Disperma quadrisepalum* C. B. Cl. in Dyer, Fl. Trop. Afr. **5**, 80 (1899).

Coleus Daviesii *E. A. Bruce*, sp. nov. [Labiatae] ; affinis *C. cunenensi* Baker sed foliis glabris, caulibus haud strigosulis pubescentibus, paniculis densioribus differt.

Herba perennis, erecta, lignosa, 1–1·3 m. alta, ramis 4-angulatis, junioribus breviter et dense glanduloso-pubescentibus, demum glabrescentibus. *Folia* petiolata, ovata vel ovato-lanceolata, apice obtusata, basi decurrentia, 2·5–4 cm. longa, 1·0–2·3 cm. lata, margine crenata, utrinque dense glandulosa, nervis infra valde prominentibus supra impressis ; petioli 0·2–1·5 cm. longi, supra sulcati. *Inflorescentia* terminalis, glandulosa et pubescens, dense paniculata, circiter 11 cm. longa, 4 cm. lata ; cymae laterales pedunculatae, ramosae, 6–10-florae, pedicellis sub anthesin usque ad 3 mm. fructu 5 mm. longis. *Calyx* bilabiatus, pubescens, 3 mm. longus, 4-lobus, lobis inferioribus aequalibus anguste oblongo-lanceolatis apice obtusis vel subacutis, lobo superiore obovato vel late oblongo apice rotundato. *Corolla* leviter puberula, circiter 9 mm. longa, labello superiore brevissimo inferiore longo concavo. *Stamina* declinata, inclusa vel leviter exserta, filamentis dimidio connatis. *Calyx* fructu circiter 6 mm. longus, glanduloso-pubescens.

TANGANYIKA TERRITORY: Rungwe District; Mt. Rungwe; a herb with white flowers 3–4 ft. high, occurring in the Camburu belt, *R. M. Davies* R.4 (type).

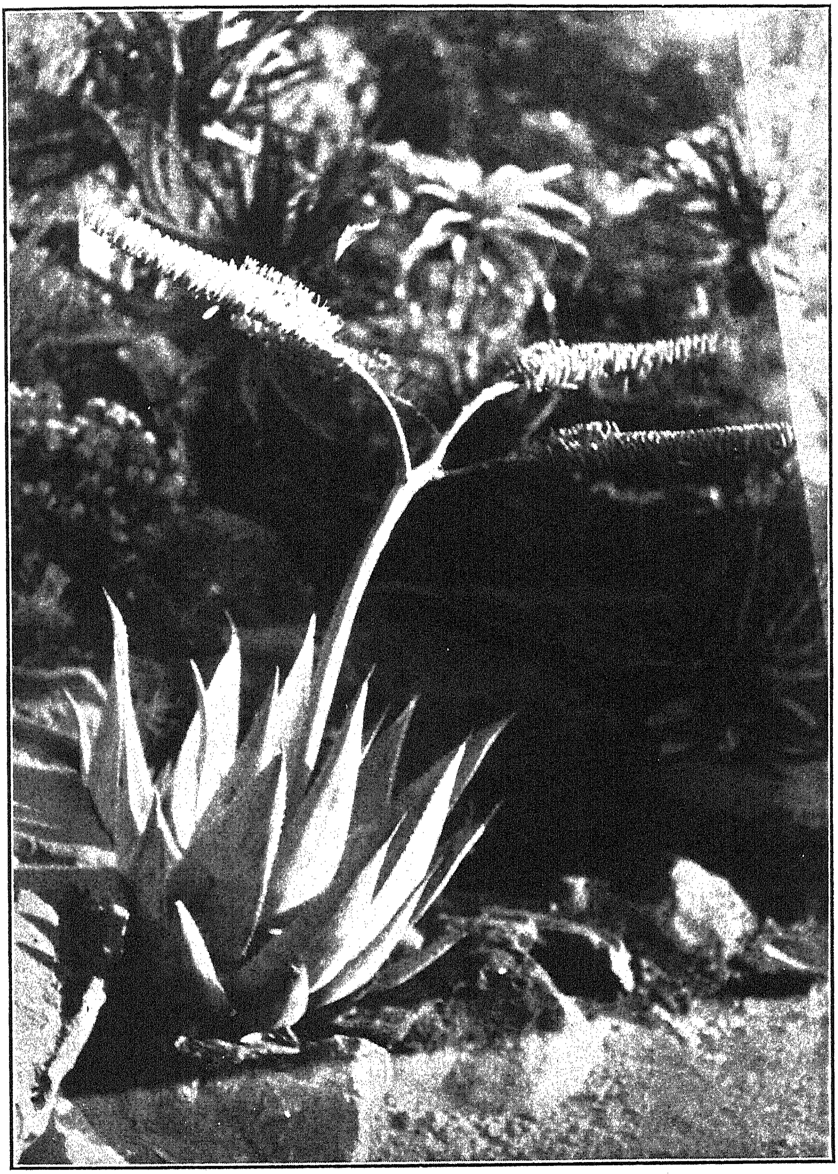
Aloë (Eualoë) ortholopha *Christian et Milne-Redhead*, sp. nov. [Liliaceae]; ab *Aloë Marlothii* Berger habitu acauli, foliis supra et subtus laevibus inermibus facile distinguitur.

Planta acaulis. *Folia* circiter 30 vel pluria, dense rosulata, erecta, lanceolata vel ovato-lanceolata, usque 55 cm. longa, medium versus 14 cm. lata et 14 mm. crassa, apice acuta, margine dentibus deltoideis 4 mm. longis corneis rubro-brunneis inferne 7 mm. superne 15 mm. distantibus armata, interstitiis rectis, supra prope basin plana, apicem versus striata, subtus gibba, glauca, griseo-viridia. *Inflorescentia* circiter 1 m. alta, ramosa, ramis 3–7 vel interdum 10 horizontalibus circiter 50 cm. longis robustis; bracteae ramos subtendentes ovato-deltoideae, 15 mm. latae, 13 mm. longae, membranaceae; bracteae vacuae infra racemum paucae, ovatae, acutae, 5-nerves, scariosae; racemi densissimi, usque 45 cm. longi, floribus conspicue secundis erectis; bracteae florum ovatae, acutae, 7 mm. latae, 12 mm. longae, 5-nerves, scariosae; pedicelli circiter 5 mm. longi, robusti, valde lateraliter compressi. *Perianthia* usque 42 mm. longa, basi 7 mm. diametro, medium versus ampliata usque 10 mm. diametro, apicem versus leviter angustata et apice leviter curvata, recta, trigona, tubo circiter 13 mm. longo, pallide aurantiaco-rubra usque saturate sanguinea; segmenta exteriora inconspicue nervosa, circiter 8 mm. lata; segmenta interiora 10 mm. lata, alba, apicem versus aurantiaco-rubra, linea mediana rubra percursa. *Stamina* robusta, valde compressa, sub anthesin 10 mm. exserta, parte inclusa pallide lutea, parte exserta brunneo-purpurea, demum in perianthium retracta; antherae 6 mm. longae, rubro-luteae. *Stylus* exsertus, pallide luteus; ovarium 9 mm. longum, 4 mm. diametro.

SOUTHERN RHODESIA: M'toroshouga Pass in the Umvukwes Hills on the Great Dyke, 5000 ft., cultivated at Salisbury, 19 Aug. 1926, *Herb. Dep. Agr. S. Rhod.* 1201 (*Eyles* 5448 in Herb. Eyles: type).

I am indebted to Mr. H. Basil Christian, for forwarding to Kew, through Mr. Eyles, a detailed English description of this *Aloë* drawn up from living specimens in his collection at Ewanrigg, and also photographs showing the habit of the plant. In his notes he says: "This *Aloë* (No. 289) has only been recorded from the M'toroshouga Pass, at an altitude of 5000 ft., on rocky treeless hills, the formation being serpentine rock. It only occurs on the hills on the south side of the pass for a distance down the pass of about 3 miles and to a depth of about half a mile. No other species of *Aloë* is found growing in the vicinity, but no. 289 is found growing in thousands. It flowers in July and August, the colour of the flowers varying in different plants from a light orange-red to a deep blood-crimson.

PLATE XVIII



Aloë ortholopha growing in Mr. Basil Christian's garden at Ewanrigg, Arcturus, Southern Rhodesia.

The flowers are secund from the bud stage, and not, as in *A. Marlothii*, at length becoming secund."

The specific epithet refers to the crest-like appearance of the horizontal racemes of upright flowers. The photograph here reproduced is of a specimen cultivated in the garden of Mr. Basil Christian at Ewanrigg, Arcturus.—E. M.-R.

LX—RESEARCHES ON SILENE MARITIMA AND S. VULGARIS : XII.*—E. M. MARSDEN-JONES AND W. B. TURRILL.

A STATISTICAL STUDY OF CHARACTERS IN TWO WILD POPULATIONS OF S. MARITIMA.

The following are the field observations on the two populations of which samples are analyzed below :

I. Chesil Beach, Abbotsbury end, Dorset, July 12 to 14, 1932. We have already considered the characters of certain plants from this locality and refer to our paper in Kew Bull. 1929, 170–173 for details.

II. Land's End District, between Nanjizal and Porthgwarra, W. Cornwall, July 15 to 20, 1932.

The habitat characters for the two populations compare and contrast as follows :—

I.	II.
Sea-coast.	Sea-coast.
Shingle, unstabilized.	Sea-cliffs.
Flint pebbles.	Granite.
Soil absent.	Soil shallow, except in crevices.
Other vegetation little or none.	Other vegetation of *Armeria, Limonium*, grasses, etc.
Competition with other species, none, ample room to spread laterally except when in competition with other individuals of the same species.	Competition with other species, often acute in closed communities, giving little room for lateral spread.
Habit prostrate and widely sprawling.	Habit low-growing and compacted.

Length of flowering stems. The longest stem per plant, including inflorescence, measured to nearest cm.

I. Maximum 4·7 dm. Minimum 2·3 dm. Mean 3·6 dm. Standard deviation 0·48.

II. Maximum 3·1 dm. Minimum 0·9 dm. Mean 1·95 dm. Standard deviation 0·46.

Length of longest internode. The longest internode, with an exception of 1 per cent. always that immediately below the inflorescence, was measured to the nearest mm.

---

* Continued from *K.B.* 1933, 362.

I. Maximum 142 mm. Minimum 30 mm. Mean 65·9 mm. Standard deviation 18·7.

II. Maximum 80 mm. Minimum 9 mm. Mean 43 mm. Standard deviation 16·0.

Anthocyanin in Vegetative parts. This has been scored into three classes—much, some, none. In the samples all plants had either much or some anthocyanin in the vegetative parts, although plants quite devoid of anthocyanin have been found both on the Chesil Beach and also in the Cornish population of which a sample is analyzed here.

The values obtained were :—

I. Much anthocyanin 97% : Some anthocyanin 3%.

II. Much anthocyanin 9% : Some anthocyanin 91%.

Indumentum. All the plants in the samples of both populations were glabrous. The term " glabrous," as we apply it to the vegetative parts in *Silene*, indicates that no hairs are developed on the stems or on the leaf-surfaces. The fluctuating character of leaf-ciliolations is considered apart from general indumentum or its absence.

Length and breadth of leaves. Measurements were made of normally developed leaves to the nearest mm.

	I.	II.
Maximum length	24	20
Minimum length	5	7
Mean length	16	12·5
Standard deviation	3·6	3·05
Maximum breadth	6	6
Minimum breadth	2	1
Mean breadth	3·34	2·63
Standard deviation	1·0	1·01
Correlation of length to breadth	0·48	0·67

The correlations of leaf (and petal) length to breadth have been worked out on the formula :—

$$r = \frac{S\,(x-\overline{x})\,(y-\overline{y})}{\sqrt{S\,(x-\overline{x})^2 \quad S\,(y-\overline{y})^2}}$$

Number of flowers. In each plant the flowers were counted in the inflorescence with the largest number.

I. Maximum 7. Minimum 1. Mean 3·11. Standard deviation 0·85.

II. Maximum 6. Minimum 1. Mean 1·72. Standard deviation 0·96.

Calyx Shape. This has been scored into three classes—inflated, subinflated, narrow (see Kew Bull. 1931, 128 and figs. 24–26).

The values obtained were :—

I. Inflated 43 : Subinflated 53 : Narrow 4.
II. Inflated 17 : Subinflated 60 : Narrow 23.

Anthocyanin in calyx. This has been scored into three classes—much, some, none. In the samples all plants had at least some anthocyanin in the calyx, although plants quite devoid of anthocyanin have been found both on the Chesil Beach and also in the Cornish population of which a sample is analyzed here. Such plants are very rare, more so in western Cornwall than on the Chesil Beach.

The values obtained were :—

I. Much anthocyanin 89%. Some anthocyanin 11%.
II. Much anthocyanin 10%. Some anthocyanin 90%.

Corolla. *Petal length and breadth.* Measurements were made to the nearest mm.

	I.	II.
Maximum length	23	22
Minimum length	14	12
Mean length	18·87	17·83
Standard deviation	1·76	1·49
Maximum breadth	13	12
Minimum breadth	4	5
Mean breadth	8·34	8·08
Standard deviation	1·56	1·41
Correlation of length to breadth	0·54	0·54

Lobing of petals. Lobing has been scored into bilobed and multilobed. All plants with some petals clearly multilobed on some flowers have been scored into the second class. The results obtained were :—

I. Multilobed 14 : Bilobed 86.
II. Multilobed 9 : Bilobed 91.

Depth of Petal Lobing. This has been scored into two classes—$\frac{3}{4}$ lobing and $\frac{2}{3}$ lobing—with the following results :—

I. $\frac{3}{4}$ lobed 100 : $\frac{2}{3}$ lobed 0.
II. $\frac{3}{4}$ lobed 93 : $\frac{2}{3}$ lobed 7.

Overlapping of Petals. The plants were scored into two classes, those in which the petals overlapped or were contiguous and those in which the petals did not overlap and were not contiguous. The results obtained were :—

I. Overlapped 85 : Not overlapped 15.
II. Overlapped 80 : Not overlapped 20.

Overlapping of Petal Lobes. The plants were scored into two classes, those in which the petal lobes overlapped or were definitely contiguous and those in which the petal lobes did not overlap and were not contiguous. The results obtained were :—

I. Overlapped 71 : Not overlapped 29.
II. Overlapped 54 : Not overlapped 46.

All four possible combinations of overlapping or not overlapping of petals and lobes occurred in each of the two samples. In both populations, as judged from the samples, overlapping of petals was more frequent than overlapping of lobes, more so in the Cornish than in the Chesil Beach population. In both samples petals and lobes overlapping (including contiguity) occurred more often than not overlapping (divergence).

Anthocyanin Blotch on Petals.

I. Present 60 : Absent 40.
II. Present 21 : Absent 79.

We know, from earlier observations, that a higher proportion of plants in the Chesil Beach population than in at least many other populations shows anthocyanin blotch on the petals.

Corona. Silene maritima usually has a well marked bifid scale on each petal, but plants with small scales sometimes occur and, very rarely, only a boss is distinguishable. The two samples here considered gave the following results on scoring into three classes :—

I. Scale (well-marked) 95 : Small scale 5 : Boss 0,
II. Scale (well-marked) 88 : Small scale 11 : Boss 1.

Sex. The plants were scored into hermaphrodite when all the flowers scorable on the date given for each sample contained functional androecium and gynoecium, female when functional stamens were absent in all scorable flowers, hermaphrodite and female (gynomonoecious) when some flowers were functionally hermaphrodite and others had no functional stamens. Stamen vestiges are always present. The results obtained were :—

I. Hermaphrodite 91 : Female 2 : Hermaphrodite and female 7.
II. Hermaphrodite 93 : Female 3 : Hermaphrodite and female 4.

Androecium. *Filament Colour.* The plants were scored for presence or absence of colour in the filaments, anthers, stigmata, and immature seeds, not for depth of colour.

The results obtained for filament colour were :—

I. Purplish 33 : White 65.
II. Purplish 23 : White 74.

This character and the next is, of course, not scorable in plants with only female flowers.

Anther Colour.

I. Purplish 98 : Yellowish-green 0.
II. Purplish 97 : Yellowish-green 0.

Gynaeceum. *Stigma Colour.*

I. Purplish 48 : White 52.

II. Purplish 33 : White 67.

Immature Seed colour (testa).

I. Purplish 100 : White 0.

II. Purplish 98 : White 0.

The character was unscorable in two plants in II.

Fruit Shape. This was scored only for a sample of 100 items collected from population I on 14 July 1932 and the sample was independent of the sample from which the vegetative and floral characters were scored.

The following results were obtained :—

Capsules of shape	I.	27
,, ,,	II.	32
,, ,,	I-II.	41

Mature Seeds. The sample used for fruit shape in I was used also for scoring the testa characters of the mature seeds, with the following results :—

I. Armadillo 91 : Weak Armadillo 9.

For II, testa characters were scored, in the field, on the plants from which other characters were scored, so far as seeds were present, with the following results :—

II. Armadillo 51 or 54·8% : Weak Armadillo 5 or 5·4% : Tubercled 37 or 39·8%.

Seven plants were not scorable for testa characters and tubercled and strongly tubercled classes were not differentiated.

Summary and Conclusions.

1. A statistical analysis is given of samples of two populations of *Silene maritima*, growing, I, on the Chesil Beach, near Abbotsbury, Dorset, and II, on cliffs near Land's End, Cornwall. The full significance of this analysis will not be apparent till after the publication of comparable analyses on high mountain populations. A comparable analysis of a population of *S. vulgaris* has been published in Kew Bull. 1932, 271.

2. The characters studied may be classified as follows :—

A. *Involving measurements.*
  - Lengths of flowering stems.
  - Lengths of longest internodes.
  - Lengths and breadths of leaves.
  - Lengths and breadths of petals.

B. *Involving counts.*
  - Numbers of flowers.

C. *Qualitative scoring.*
  - Anthocyanin in vegetative parts.
  - Indumentum.
  - Calyx shape and anthocyanin.
  - Lobing, depth of lobing, overlapping, and anthocyanin of petals.

Corona.
Sex.
Anthocyanin in filaments, anthers, stigmata, and immature seeds.
Fruit shape.
Testa markings.

3. Attention is called to the following :—

i. All the plants scored were without hesitation placed in the species *S. maritima*, i.e., they showed the range of habit and general total of characters associated in this species.

ii. The two populations showed statistical differences as follows :—

	I.	II.
Stem mean length	3·6 dm.	1·95 dm.
Longest internode mean length	65·9 mm.	43 mm.
Leaves mean length	16 ,,	12·5 ,,
Leaves mean breadth	3·34 ,,	2·63 ,,
Flowers mean number	3·11	1·72
Petals mean length	18·87 mm.	17·83 mm.
Petals mean breadth	8·34 ,,	8·08 ,,

The contrast in the figures in this table is partly due to the considerable differences in environment under which the two populations were growing. It will be noted that the means are consistently higher for population I, which was subjected to no competition with vegetation composed of other species. On the other hand, we know that the population on the Chesil Beach as a whole is heterozygous for habit and leaf shape, and though the sample was taken from that end where *S. maritima* is least polymorphic the lower correlation of length to breadth of leaves (0·48) compared with that (0·67) for the Cornish population may be connected with genetic differences. That the populations show exactly the same (0·54) correlation for length to breadth of petals was an unexpected coincidence.

iii. The Dorset population (I) had much more anthocyanin in the vegetative parts and in the calyx than had the Cornish population (II). On the other hand no plants in the random samples were devoid of anthocyanin, though such plants have been found in both areas, but are rarer in the Cornish population.

iv. Anthocyanin blotch on the petals, purplish filaments, and purplish stigmata were all commoner in the Dorset population.

v. All plants scorable for the characters in both populations had purplish anthers and purplish immature seeds.

vi. All plants in both populations were glabrous.

vii. The Cornish population had, on the whole, narrower calyces than the Dorset population.

viii. Plants with multilobed petals occurred in both populations. Petal lobing was entirely ¾ on the Chesil Beach and mainly ¾ (93%) in western Cornwall.

ix. Overlapping of petals and, less markedly especially in the Cornish population, of segments predominated over not-overlapping.

x. The coronal scales were mostly well developed, though small scales occurred in an average of 8% of plants and a mere boss in one plant in Cornwall.

xi. The majority of the plants had only hermaphrodite flowers, but female and gynomonoecious plants occurred in both populations.

xii. There were considerable differences in testa markings in the two samples. In that from Dorset no tubercled seeds occurred, but nearly 40 per cent. of the Cornish sample had tubercled seeds.

The research on which this paper is based has been aided by a Royal Society Government Grant. The detailed tables of measurements, summarized in the above account, have been filed in the Genetical Herbarium at Kew.

LXI—NEW SPECIES OF NOTOTRICHE AND MALVASTRUM FROM THE ARGENTINE. A. W. HILL.

An interesting collection of Nototriches and Malvastrums was sent to Kew recently for determination by Dr. R. A. Pérez Moreau of the National Museum of Natural History, Buenos Aires. Some of them had been collected by Dr. Castellanos, Chief of the Botanical Section of the Museum, in the Sierra Famatina in the years 1928 and 1930. Three proved to be new species, which are here described, two being Nototriches, *N. caesia* and *N. rosulata*, and the other an interesting new *Malvastrum*; two of the new plants were collected by P. Jörgensen in 1916 and one by Rodriguez in 1912.

Nototriche rosulata *A. W. Hill*, sp. nov.; *N. pulvillae* A. W. Hill affinis, stipulis brevioribus laminis supra paullo stellatis infra glabris praecipue differt.

Fruticulus depressus, caespitosus, pulvinatus; caudex subterraneus, lignosus, ramosus. *Folia* arcte aggregata; petiolus 8 mm. longus; stipulae petiolo ultra medium adnatae et cum eo quasi vaginam membranaceam formantes, parte libera membranacea lineari-subulata 3 mm. longa, uti vagina superficie glabra ad margines stellato-tomentosa; lamina ambitu late triangulari-ovata, ad basin cuneata, palmatifida, 7–8 mm. longa, 6 mm. lata, supra sparse tomentosa, infra glabra, segmento medio elongato 12–13-lobato intermediis 3-lobatis, inferis fere integris. *Flores* petiolo medio insidentes, fere sessiles. *Calyx* supra medium 5-lobus, 7 mm. longus, lobis 3 mm. longis triangulari-acutis extra et ad margines praesertim hirsutis. *Corolla* violacea, 1·2 cm. longa; petala obovata, 4 mm. lata, apice oblique biloba, basi in tubum circiter 2 mm. longum

coalita. *Carpella* circiter 12, 4·5–5 mm. longa, birostrata, dorso stellato-ciliata, rostris 2 mm. longis.

ARGENTINA. Dep. Andalgalá; 30.III.1916, *P. Jörgensen* 1345 (Mus. Nac. Hist. Nat. Buenos Aires, 3097).

Nototriche caesia *A. W. Hill*, sp. nov.; *N. Hieronymi* A. W. Hill affinis, sed foliis infra subglabris lobis utrinque subglabris rostris carpellorum longioribus praecipue differt.

Fruticulus parvus, depressus, caespitosus, pulvinatus; caudex subterraneus, lignosus, firmus. *Folia* arcte aggregata; petiolus circiter 1·5 cm. longus, supra vaginam utrinque minute tomentosus; stipulae petiolo supra medium adnatae et cum eo quasi vaginam latam formantes, parte libera lanceolata circiter 5 mm. longa, marginibus uti vagina longe stellato-tomentosae; lamina valde 5-loba vel 5-secta, circiter 6 mm. longa et lata, infra glabra vel subglabra, supra ad basin pulverulento-stellato-tomentosa, lobulis carnosulis glabris; segmenta multilobulata lobulis obovatis, media maxima, 2 exteriora trilobulata. *Flores* petiolo supra medium insidentes, breviter pedicellati. *Calyx* 7 mm. longus, extra glaber, lobis 3 mm. longis triangularibus intus hirsutis. *Corolla* caerulea (teste *Rodriguez*), 1·1 cm. longa; petala oblongo-ovata, apice inaequaliter biloba, basi in tubum 2·5 mm. longum coalita. *Stamina* in caput globosum disposita. *Carpella* 5 mm. longa, birostrata, dorso longe stellato-ciliata, rostris circiter 2·5 mm. longis.

ARGENTINA. Prov. Tucuman: El Pelado, 19.III.1912, *Rodríguez* 443 (Mus. Nac. Hist. Nat. Buenos Aires 3099).

Malvastrum tuberculatum *A. W. Hill*, sp. nov.; *M. nubigenae* Baker fil. affinis, sed foliis paullo sectis basi auriculatis, carpellis dorso tuberculatis praecipue differt.

Fruticulus depressus; caudex subterraneus, lignosus, firmus. *Folia* rosulata, solo appressa; petiolus 3·5–4 cm. longus, supra sparse pilosus; stipulae petiolo adnatae et cum eo quasi vaginam membranaceam 7 mm. longam formantes, parte libera membranacea lanceolata 8–10 mm. longa glabra; lamina ambitu suborbicularis, basi auriculata, circiter 1·5 cm. longa, 1–1·3 cm. lata, 7–9-lobata lobis paullo et irregulariter crenato-lobatis vel -sectis, supra glabra infra ad nervos tantum sparse pilosa. *Flores* solitarii pedunculis sparse pilosis vel glabris; involucrum persistens prophyllis tribus 4–5 mm. longis linearibus glabris. *Calyx* 8 mm. longus, extra glaber, segmentis 5 mm. longis intus dense stellato-pubescentibus. *Corolla* 1·5 cm. longa; petala obovata, 8 mm. lata, basi hirsuta, in tubum circiter 1 mm. longum coalita. *Stamina* in caput globosum disposita, columna 4 mm. longa. *Carpella* reniformia, 2·5 mm. longa, dorso tuberculata.

ARGENTINA. Dep. Andalgalá (Catamarca), 30. III. 1916, *P. Jörgensen* 1346 (Mus. Nac. Hist. Nat. Buenos Aires 3098).

Malvastrum Fiebrigii Ulbrich. Salta, Cerro de Cajón, La Laguna; 9.II.1914, Rodriguez 1303 (Mus. Nac. Hist. Nat. Buenos Aires, 3096).

Nototriche famatinensis A. W. Hill. La Rioja, Sierra Famatina, Alto Blanco; 20.I.1928, Castellanos 28/236c. Catamarca, Chucula; 1.II.1930, Castellanos 30/555.

N. aff. *famatinensi* A. W. Hill. La Rioja, Sierra Famatina, Alto Blanco; 20.I.1928, Castellanos 28/236A, B.

N. Niederlinii A. W. Hill. La Rioja, Sierra Famatina, Alto Blanco; 20.I.1928, Castellanos 28/235.

N. pulvilla A. W. Hill. Salta, Cerro del Cajón, La Laguna; 14.II.1914. Rodriguez 1358 (Mus. Nac. Hist. Nat. Buenos Aires, 3095).

N. rugosa A. W. Hill. Catamarca, Juntas de Panizo; 4.II.1930, Castellanos 30/556.

N. transandina A. W. Hill. San Juan, Valle del Cura Las Máquinas; 3.I.1930, Pérez Moreau 30/128. San Juan, Cordillera de Vacas Heladas; 8.I.1930, Pérez Moreau.

LXII—CONTRIBUTIONS TOWARDS A FLORA OF BRITISH NORTH BORNEO: III.*

The previously known distribution of each plant is given between its name and its distribution in British North Borneo.

Xanthophyllum ellipticum *Korth.* [Polygalaceae].

Dutch Borneo.

Mempakul plain, Kg. Manggis, fls. pink, March, *Goklin* in Herb. For. Dept. 2278. "30 ft. high, 10 in. girth."

Dusun name: *Keramundoi*.

Pyrenaria parviflora *Ridley*, sp. nov. [Theaceae]; a *P. Kunstleri* King, cui affinis, foliis chartaceis sparse hirtis, ramis petiolis decurrentibus differt.

Small *tree*; twigs angulate, glabrous, with decurrent ribs from the bases of the petioles. *Leaves* chartaceous, lanceolate, acutely acuminate, base gradually attenuate, glabrous above, midrib impressed above, midrib and 9 pairs of nerves raised below and sparsely rigidly appressed-hairy, the nerves anastomosing near the serrate margins; petioles 5–7 mm. long, pubescent. *Flowers* small; pedicels thick, 4 mm. long, silky-velvety. *Bracts* ovate-rotundate, 2 mm. long, velvety. *Sepals* ovate-rotundate, 5 mm. long, silky. *Petals* and *stamens* not seen. *Ovary* ovoid, densely white silky; style rather stout, glabrous; stigma 5-lobed, lobes linear. *Berry* subturbinate, 2 cm. diam., glabrous, 5-celled. *Seeds* 5, elliptic, pale brown.

---

*Continued from *K.B.* 1932, 295.

Elphinstone Province, Tawao, *Elmer* 21148.

Merrill suggests that this plant is *P. Kunstleri* King, of the Malay Peninsula, which certainly resembles it in its small flowers, but the leaves are thinner and sparsely hairy and the nervation is quite different. The ribs running down the branches from one node to the other are also an important distinction.

Boschia oblongifolia *Ridley*, sp. nov. [Bombacaceae]; a *B. acutifolia* Mast., cui affinis, foliis majoribus oblongis vix cuspidatis, nervis supra depressis, floribus majoribus differt.

Tree. Leaves coriaceous, elliptic-oblong, acute, base obtuse, 9·5–15 cm. long, 4–6·5 cm. wide, smooth above, scaly below, nerves 9 pairs, depressed above; petioles 5–15 mm. long. *Flowers* axillary, pedicels 5 mm. long, angular, scaly. *Sepals* 4, ovate, obtuse, 1·2 cm. wide, scaly, pubescent within. *Stamens* 4, narrowed from a broad base, 5 mm. long, anthers 4–6, usually 4; staminodes several. *Ovary* oblong, furnished with stellate hairs.

Mount Bungal, fls. Dec., *Mrs. M. S. Clemens* 11218.

This is very distinct in the oblong-elliptic leaves with depressed nerves.

Sterculia Burbidgei *Stapf* MS., sp. nov., a *Ridley* descripta [Sterculiaceae]; a *S. Pearsonii* Merrill, cui affinis, floribus multo majoribus, calyce urceolato vix subgloboso, paniculis majoribus laxis differt.

Small *tree*. Bud *scales* and *stipules* several, coriaceous, lanceolate, acute, dentate towards the apex, margins hairy, papillose on the back, 3 cm. long, 5 mm. wide. *Leaves* decurrent, coriaceous, oblanceolate, cuspidate (cusp 2 cm. long), 23–39 cm. long, 6·5–12·5 cm. wide, glabrous above except the midrib, hairy below on the raised midrib and 21 pairs of nerves; young leaves uniformly tomentose on the lower surface, transverse anastomosing nervules raised; petioles thick, 1 cm. long, hairy. *Panicles* large, lax, 38 cm. long, branches 4–5 cm. long, rufous-hairy; pedicels 2 mm. long, rufous-hairy. *Male flowers*: *Calyx* urceolate, densely velvety, 1 cm. long, white-pilose within, lobes 5, linear. *Anthers* 5 in a capitulum, oblong, incurved, glabrous. *Female flowers*: *Calyx-lobes* short. *Ovary* densely hairy. *Style* prominent, densely hairy, stigmas recurved, glabrous. *Follicles* 5, lanceolate, cuspidate, velvety outside, 12 cm. long, 4 cm. wide (when dry). Seeds oblong, black, 1·8 cm. long.

Koung, *Burbidge*. Also in Sarawak: Kuching, *Haviland* 2229 (type in Herb. Kew.), " inflorescence red "; Miri, *Haviland & Hose* 2171; *Beccari* 3153; *Haviland* 736.

This species is undoubtedly allied to *S. Pearsonii* Merr. of Banguey Island and British North Borneo (Kabu China, *Creagh*) but in that species the panicles are denser and the flowers much smaller.

Sterculia Clemensiae *Ridley*, sp. nov. [Sterculiaceae]; a *S. obovata* Merrill, cui affinis, foliis angustioribus, floribus minoribus differt.

Tree; young twigs rufous-velvety. *Leaves* chartaceo-coriaceous, obovate, shortly cuspidate, base attenuate, obtuse, 10–13 cm. long, 4–7 cm. wide, glabrous above except the midrib, stellate-hairy below, midrib and nerves densely rufous-tomentose, nerves 8 pairs, raised, transverse anastomosing nervules raised; petioles 1·5 cm. long, rufous-tomentose. *Panicles* slender, 7–8 cm. long, rufous-tomentose, branches short. *Male flowers*: *Calyx* urceolate, 5 mm. long, hairy, lobes linear, incurved, 4 mm. long, hairy. *Androecium* minute; anthers 4, oblong, incurved. *Female flowers* not seen. *Follicles* lanceolate, apex subacute, 5 cm. long, 4 cm. wide, rufous-velvety; seeds 5, oblong.

Kiau, Mt. Kinabalu, fls. Nov., *Mrs. M. S. Clemens* 10094.

Sterculia megistophylla *Ridley* [Sterculiaceae].

W. Sumatra.

Hill at Kg. Anoman, 30 ft., fls. yellow, March, *Melegrito* in Herb. For. Dept. 2265, " 60 ft. high, 3 ft. girth, used for building." Kadayan name: *Biris merah.*

Pterospermum Stapfianum *Ridley*, sp. nov. [Sterculiaceae]; a *Pt. Blumeano*, cui affinis, foliis majoribus oblongis subcordatis subpeltatis, floribus multo majoribus differt.

Large *tree*; branchlets ferruginous-tomentose. *Leaves* sub-coriaceous, oblong, shortly cuspidate, base obliquely cordate or subcordate, subpeltate, 7–13 cm. long, 4·5–6 cm. wide, glabrous above, ferruginous-tomentose below, nerves 8 pairs, slender; petioles 5 mm. long, densely tomentose. *Flowers* axillary, large, pale-yellow; pedicels 1·5 cm. long. *Sepals* 5, linear, acute, 6 cm. long, 4 mm. wide, ferruginous-furfuraceous without, grey-velvety within. *Petals* obovate, clawed, apex rounded, 5 cm. long, 2·5 cm. wide. *Stamens*: filaments slender, 2 cm. long; staminodes sub-equal. *Gynophore* 1 cm. long. *Ovary* conical, flavous-hairy; style 3 cm. long, hairy at the base. *Capsule* terete, oblong, papillose, glabrous, fuscous, 9 cm. long.

Tuskayo, fls. April, *Creagh*; without precise locality, *D. D. Wood* 2253. Also elsewhere in Borneo: Rejang Belaga, fls. Nov., *Haviland* 2125 (type); Sarawak, *Beccari* 3811; Baram, fls. April, *Hose* 590; Banjermasin, not rare in wet places, *Motley* 945, " tall tree, flowers light yellow; the leaves on young plants are palmate and often 6 inches in diameter."

Korthals described a species from Borneo under the name of *Pt. elongatum*, but so incompletely that it is unrecognisable. It is possible that he intended this plant, but it is quite uncertain.

Grewia antidesmifolia *King* var. **hirsuta** *King* [Tiliaceae].

Perak, Malay Peninsula.

Hill at Kg. Anoman, fls. white, March, *Melegrito* in Herb. For. Dept. 2267. " 50 ft. high, 2 ft. 6 in. girth, used for building purposes." Kadayan name: *Damak-Damak.*

Microcos Creaghii *Ridley*, sp. nov. [Tiliaceae]; affinis *M. stylocarpae* Warb., foliis minoribus subtus hirtis, nervis paucioribus, paniculis axillaribus gracilibus differt.

Tree; branchlets glabrous. *Leaves* coriaceous, elliptic-oblong, apex acute, base obtuse, 6–12 cm. long, 4–5 cm. wide, glabrous above, hairy on the raised midrib and 5 pairs of nerves below; petioles 1 cm. long, hairy. *Panicles* axillary, racemiform, slender, 6 cm. long, branches 1 cm. long, stellate-hairy; bracts linear-oblong, 2 mm. long; pedicels 2 mm. long. *Sepals* cucullate, oblong, obtuse, 1·5 mm. long, tomentose, glabrous within. *Petals* broadly obovate, half as long as the sepals, bearded within. *Stamens* about 30, glabrous. *Ovary* ovoid, glabrous.

Sandakan, fls. May, *Creagh*.

Microcos reticulata *Ridley*, sp. nov. [Tiliaceae]; a *M. globulifera* Burr., cui affinis, differt foliis ovatis acuminatis majoribus, ramis paniculis et nervis dense hirsutis, stipulis lobatis glabris.

Shrub or small tree; branchlets densely rufous-tomentose with stellate hairs. *Leaves* chartaceous, lanceolate-ovate, long-acuminate, base rotundate, 18–21 cm. long, 9–10·5 cm. wide, glabrous above, copiously stellate-pilose below, midrib and 10 pairs of nerves raised and rufous-tomentose, secondary transverse nerves and reticulations raised; petioles stout, 1 cm. long, rufous-tomentose; *stipules* 4–6-lobed, lobes linear, thick, 3 mm. long, subglabrous. *Panicles* axillary, 10 cm. long, densely rufous-tomentose; *bracts* linear, 4 mm. long, silky; *pedicels* 2 mm. long. *Sepals* cucullate, linear-oblong, 5 mm. long, densely silky, pubescent within. *Petals* linear-lanceolate, 3 mm. long, glabrous except the pubescent base. *Stamens* up to 60; filaments red. *Gynophore* short, hairy. *Ovary* subovoid, densely hirsute, 5-locular.

Without locality, *Creagh* (type in Kew Herb.). Also in Sarawak, Gunong Pensaung, *Anderson* 160.

Undoubtedly allied to *M. globulifera* Burret, but differing in the very densely hairy branches and underside of leaves and ovary. The panicles too are larger and less branched and the stipules are longer and nearly glabrous. The leaves in Anderson's specimen are oblong and the whole plant subglabrous. It has glabrous pyriform fruits, 2·5 cm. long and 1 cm. through, and is possibly distinct.

Erioglossum rubiginosum *Bl.* [Sapindaceae].

Various parts of the Malayan Region.

In Mempakul plain at Kg. Bundu, fls. white, March, *Goklin* in Herb. For. Dept. 2280, "20 ft. high, 4 in. girth; fruit edible." Dusun name: *Berbogon*.

SAPINDACEAE.

Otophora glandulosa *Radlk.* MS., sp. nov., a *Ridley* descripta [Sapindaceae]; *O. erythrocalyci* Hiern affinis, sed foliis longioribus, floribus et fructibus multo minoribus, antheris sericeis differt.

Shrub or small tree. *Leaves* up to 7-jugate, petiole 19 cm. long, glabrous. *Leaflets* alternate or subopposite, subcoriaceous, elliptic-lanceolate, shortly acuminate, base cuneate, 35 cm. long, 10 cm. wide; primary nerves up to 6 pairs, raised below, secondary nerves and reticulations conspicuous below; petiolules thick, transversely rugose, 1 cm. long. *Panicle* elongate, 37 cm. long, glabrous; rhachis obscurely angled, branches straight, slender, lowest 18 cm. long. *Flowers* small, numerous, glomerate, glabrous. *Pedicels* 3 mm. long. *Sepals* 4, rotund. *Petals* 4, obovate, much smaller. *Stamens* 8; anthers oblong, silky. *Pistil* glabrous, oblong, stigma sessile. *Drupes* elliptic, subcomplanate, glabrous, 8 mm. long. *Seeds* 1–2, ovoid, 7 mm. long.

Sandakan, *Creagh* (type); Sandakan, Myburgh Province, *Elmer* 20128; and probably also Mt. Kalawat, *Mrs. M. S. Clemens* 11175.

This plant is closely allied to *O. erythrocalyx* Hiern of the Malay Peninsula. The leaves, however, are very much longer than any I have seen of that species, the flowers and fruits much smaller and the anthers silky. Radlkofer gave the name to Elmer's sheet 20128, but did not publish a description; *vide* Merrill, Univ. Cal. Publ. Bot. **15**, 172.

Semecarpus lanceolatus *Ridley*, sp. nov. [Anacardiaceae]; *S. albescenti* Kurz affinis, foliis lanceolatis acuminatis, floribus majoribus distincta.

Tree, branchlets velvety-hairy. *Leaves* lanceolate, shortly acute, base acuminate, 18–21 cm. long, 3·5 cm. wide; subcoriaceous, glabrous above, below the 18 pairs of nerves raised and hairy, midrib stout, raised; petioles 1–1·4 cm. long, thick. *Panicles* lax, 30 cm. long, velvety, branches remote, patent, 11 cm. long. *Flowers* solitary or few aggregated; pedicels hairy, 2 cm. long. *Calyx* obconic, hairy, lobes triangular, acute 1 mm. long. *Petals* 5, lanceolate, acute, 2 mm. long, silky without. *Stamens* much shorter. *Ovary* globose, hairy.

Tawan, East Coast, near beach, *Creagh.*

Saraca crassifolia *Ridley*, sp. nov. [Caesalpiniaceae]; a *S. palembanica* Miq., cui affinis, foliis majoribus crasse coriaceis, bracteis multo minoribus, corymbis densioribus brevioribus, pedicellis longis differt.

Tree. *Leaves* 2–5-jugate; leaflets opposite, coriaceous, oblong or oblong-lanceolate, subacute, base narrowed or rounded, subcordate, 30–38 cm. long, 9–13 cm. wide, midrib and 15 pairs of nerves raised on both faces; petiolules stout, 1 cm. long, rugose. *Corymbs* axillary, 4–5 cm. long, glabrous, branches slender. *Bracts* lanceolate, acute, 1 mm. long. *Peduncles* 1 cm. long. *Bracteoles* oblong-rotund, 5 mm. long. *Pedicels* 5 mm. long, slender. *Calyx* orange-yellow, tube cylindric-urnshaped, 1 cm. long, lobes oblong-rotund, 5 mm. long. *Stamens* 4 or 5; filaments slender, 1·5 cm. long. *Ovary* 7 mm. long, glabrous; style short.

Sandakan and Myburgh, *Creagh*. Also in Sarawak: Kuching, *Haviland* 1825 (type in Kew Herb.), "calyx and bracts orange-yellow, disc red, style short, curved"; *Haviland & Hose* 3619; *Beccari* 749. Malay Peninsula: Perak, Larut, *Kunstler* 5511.

This plant has been referred to *S. macroptera* Miq. by various authors and is the *S. macroptera* var. *parviflora* Prain, based on the Perak plant quoted above, which appears to be identical with the Bornean plant, though the flowers seem to be smaller, probably because the corymbs are not fully developed. Kunstler describes it as a tree 30–40 feet tall, leaves glossy light green, leaflets eight to ten pairs. Flower a rich bright yellow. In *S. palembanica* Miq., which it most resembles, the leaves are thinner, the corymbs are more wide-spreading and lax, the pedicels of the flowers 3 cm. long.

Saraca Elmeri *Ridley*, sp. nov. [Caesalpiniaceae]; a *S. Zollingeriana* Miq., foliolis oblongis obtusis, floribus minoribus differt.

Tree. Leaves 3-jugate; leaflets coriaceous, oblong, obtuse, base rotund, 10–18 cm. long, 5–7 cm. wide, midrib and 14 pairs of nerves puberulous below, secondary nerves and reticulations raised below; petiolules stout, 4 mm. long. *Corymbs* axillary, 4–5 cm. long, glabrous, branches slender, congested. *Bracts* lanceolate, acute, margins ciliate; bracteoles subopposite, subsimilar, 5 mm. long, 2 mm. wide. *Calyx-tube* cylindric, 9 mm. long, glabrous, lobes oblong, obtuse, 5 mm. long, 2 mm. wide. *Stamens* 4; filaments 1·5 cm. long. *Ovary* stipitate, hairy on the back; style filiform, 7 mm. long.

Elphinstone Province, Tawao, *Elmer* 20707.

Referred by Merrill to *S. triandra* Baker, from which it is altogether different. It is allied rather to *S. Zollingeriana* Miq., but differs in the oblong, obtuse leaves and smaller flowers.

Pithecellobium Elmeri *Ridley*, sp. nov. [Mimosaceae]; a *P. microcarpo* Benth., cui affine, foliolis multo majoribus, paniculis ferrugineis nec hirtis, floribus multo minoribus, legumine multo majore differt.

Tree; branchlets lenticellate, rufous-puberulous. *Leaves* 15–16 cm. long; rhachis sparsely puberulous; leaflets 3 pairs, opposite, chartaceous, elliptic, obtusely acuminate, base narrowed, usually oblique, 7·5 cm. (lower) –11 cm. (terminal) long, glabrous above except the midrib, sparsely pubescent below, nerves 7 pairs, pubescent below; petiolules stout, 3 mm. long. *Panicles* terminal, laxly many-flowered, 16 cm. long, rufous-velvety; branches 5–7 cm. long. *Bracts* lanceolate, 2 mm. long, rufous-velvety. *Flowers* subsessile, 3–4 congested at the tips of the branchlets. *Calyx* campanulate, 1 mm. long, hairy, lobes 5. *Corolla* campanulate, 4 mm. long, pubescent, lobes 5, subacute. *Stamens* many, 4 mm. long. *Legume* contorted, undulate, 9 cm. long, 1 cm. wide, red, glabrous; seeds 9–12, elliptic, 8 mm. long, black.

Myburgh Province, Sandakan, *Elmer* 20182, 20290 (type in Kew Herb.), 20324. Also Sarawak, near Kuching, *Haviland* "d.q.e.b."

Pithecellobium Havilandii *Ridley,* sp. nov. [Mimosaceae]; a *P. lobato* Benth, cui affine, foliolis latioribus ovatis, panicula ferruginea, floribus paucioribus, corolla longioribus differt.

Tree; branchlets lenticellate. *Leaves* 2- or 3-jugate, 14 cm. long; leaflets subcoriaceous, alternate, ovate or obovate, obtuse or obtusely cuspidate, base narrowed, oblique, 8–10 cm. long, 4–7 cm. wide, glabrous, reddish-brown below, 5 pairs of nerves raised, inarching, secondary nerves and transverse nervules few and raised below; petiolules stout, 2 mm. long. *Panicles* 6–7·5 cm. long, rufous-furfuraceous, branches few, remote, 2–5 cm. long. *Flowers* sessile, 5–8 congested at the tips of the branchlets, 1 cm. long. *Calyx* urceolate, 2 mm. long, pubescent, lobes 5, triangular, short. *Corolla* tubular, 4 mm. long, pubescent, lobes ovate, short. *Stamens* numerous, 8 mm. long.

Ulu Tawaran, 2000 ft., in young jungle, *Haviland* 1369.

Stapf in Trans. Linn. Soc. Bot. **4,** 144, refers this to *P. bigeminum* Mart., whilst Merrill refers it to *P. lobatum* Benth. It does not seem to me to be either of these species. The former appears to be confined to India.

Kandelia candel *Merr.* [Rhizophoraceae].

Malayan Region generally.

Nabahan River, *Melegrito* in Herb. For. Dept. 2263. Vernacular name: *Lingg-jong.*

Terminalia Creaghii *Ridley,* sp. nov. [Combretaceae]; a *T. citrina* Roxb. var. *malayana* King, cui affinis, differt nervis conspicue elevatis, nervulis transversis copiosis tenuibus parallelis, paniculis terminalibus, calycis lobis minimis obscuris.

Glabrous *tree. Leaves* coriaceous, opposite, oblong or elliptic, cuspidate, cusp obtuse, mucronulate, base obtuse or rotund, 10–12 cm. long, 3–5 cm. wide, glabrous, shining, 10-11 pairs of nerves and numerous transverse nervules raised below; petioles 1 cm. long, scabrid. *Panicles* terminal, 7–9 cm. long, pubescent. *Flowers* numerous, subsessile. *Calyx* broadly campanulate, 2 mm. long, 3 mm. wide, puberulous, woolly within, teeth short, obscure. *Stamens* 10; filaments terete, narrowed upwards, 4 mm. long, glabrous; anthers oblong. *Style* terete, slightly longer.

Kinabatangan, *Creagh.*

Eugenia incarnata *Elmer* [Myrtaceae].

Philippine Islands.

Kuala Merontongan, in second growth forest at 22 ft., frt. May, *Lumau* in Herb. For. Dept. 1958, " 22 ft. high, 3 in. girth, frt. white when ripe; used for building." Brunei name: *Jambu keresek.*

The specimen agrees with Elmer's and with the description except in the colour of the fruit; perhaps the fruit was not really ripe.

Sonerila Gibbsiae *Ridley,* sp. nov. [Melastomaceae]; species pumila *S. pictae* Korth. affinis, staminibus brevioribus differt.

Glabrous *herb,* 7–10 cm. high. *Leaves* herbaceous, ovate, symmetric, obtuse, base rounded, 3–5 cm. long, 1–3·5 cm. wide, usually furnished with white dots, margins serrulate, nerves 2–3-paired; petioles 5–10 mm. long. *Flowers* 8, secund, small. *Calyx* urn-shaped, 4 mm. long, teeth obtusely triangular, short. *Petals* lanceolate, acuminate, 5 mm. long, pink. *Stamens* 3; anthers acutely acuminate, sagittate. *Capsule* urceolate, quadrangular, smooth, 5 mm. long, 3 mm. wide at the apex, base narrowed into a pedicel 5 mm. long.

Tawaran river, 2500 ft., *Haviland* 1284; Sandakan, *Creagh*; Dent Province, between Apiou-Apiou and Tamburan, *Miss L. S. Gibbs* 2985 (type in Kew Herb.), "flowers pink, leaves pinkish with undersides red, with or without white veins down the centre"; Mount Kalawat, *Mrs. M. S. Clemens* 11183.

Memecylon caloneuron *Miq.* [Melastomaceae].

Malay Peninsula and Islands including Sarawak and Dutch Borneo.

Mempakul hill, Kg. Manggis, fls. white, March, *Goklin* in Herb. For. Dept. 2279, "21 ft. high, 4 in. girth." Dusun name: *Merbinga.*

Memecylon paniculatum *Miq.* [Melastomaceae].

Malay Archipelago.

Kota Klias plain, buds July, *Goklin* in Herb. For. Dept. 2254. "50 ft. high, 10 in. girth." Bisaya name: *Lumbai Andu.*

Schefflera elliptica *Harms* [Araliaceae].

Dutch Borneo.

Mangsod hill, fls. white, May, *Goklin* in Herb. For. Dept. 2253, "leaves medicinal."

Arthrophyllum Havilandii *Ridley,* sp. nov. [Araliaceae]; ab *A. congesto* Ridley, cui affinis, differt foliis lanceolatis acuminatis, pedicellis multo longioribus.

Glabrous *tree* 4 mm. high. *Leaves* bipinnate, 2·5 m. long; pinnae 3-foliolate, opposite, 14 cm. long; leaflets lanceolate, obtusely acuminate, base narrowed, 8–10 cm. long, 2–3·5 cm. wide, nerves 5 pairs, slender, curved; 4 simple leaves, similar to the leaflets, 4–7 cm. long, borne at the nodes; lateral petiolules 5 cm. long, terminal 2·5 cm. long. *Panicles* with stout peduncles 15 cm. long, 4 mm. diam.; branches stout, umbellate, 7 cm. long, rufous-purple upwards. *Flowers* up to 30 in an umbel; pedicels 5 mm. long. *Calyx* obconic, 2 mm. long, margins sinuate, firm. *Petals* 5, ovate-oblong, obtuse, 3 mm. long. *Stamens* 5; anthers oblong, large. *Style* short.

Kinabulu, Tampassuk, Kiau, 3500 ft., *Haviland* 1254, "12 feet tall, leaves up to 5 feet long."

I have seen only one of the smaller upper leaves, which is about 15 inches long. This plant is called *A. diversifolium* Bl. by Stapf in his account of the Kinabalu collections, but that species appears to be strictly confined to Java.

Actinodaphne Maingayi *Hook. f.* var. **macrocarpa** *Gamble* [Lauraceae].

Malay Peninsula.

Kg. Anoman, 20 ft., fls. white, March, *Melegrito* in Herb. For. Dept. 2271, " 40 ft. high, 2 ft. 4 in. diam., in hard soil; used for building." Kadayan name: *Pengalaban gala.*

Phoebe opaca *Bl.* [Lauraceae].

Malay Peninsula and Islands.

Kg. Anoman, 40 ft., fls. white, March, *Melegrito* in Herb. For. Dept. 2266, " 50 ft. high, 2 ft. 6 in. girth; used for building." Kadayan name: *Medang lada.*

Ostodes macrophylla *Benth.* [Euphorbiaceae].

Malay Peninsula, Sarawak and Philippine Islands.

Kota Klias plain, fls. white, July, *Goklin* in Herb. For. Dept. 2257, " 27 ft. high, 6 in. girth; used medicinally." Brunei name: *Putat rimba.*

Ficus stolonifera *King* [Moraceae].

Known only from Sarawak.

Sandakan and vicinity, *M. Ramos* 1391, 1887.

LXIII—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA: XVIII.* N. Y. SANDWITH.

THREE NEW MONOCOTYLEDONS FROM BRITISH GUIANA.

Mapanea (Subgen. **Pycnocephala**) **fluviatilis** *Sandwith,* sp. nov. [Cyperaceae]; inter *M. macrophyllam* (Boeck.) Pfeiff. (*M. Schomburgkii* C. B. Clarke) et *M. pycnocephalam* Bth. ponenda; ab illa, cui foliis bracteisque satis similis, culmo haud laevi, spicis castaneis partibusque floralibus multo minoribus primo visu distinguenda; ab hac foliis bracteisque pro rata multo longioribus atque latioribus, glumis squamellisque longioribus, praeterea carina squamellarum lateralium fere laevi sparsissime tantum spinuloso-hispidula differt.

Herba satis elata atque robusta; basis cum radice deest. *Folia* usque 1·13 m. longa, basi vaginali complicata brunneo-purpurascente ad 9–12 cm. longa, 1–2 cm. lata, parte angusta petioloidea circiter 8–9 cm. longa, 3–5·5 mm. lata, tum lamina ipsa 4–6 cm. lata subtus prominenter nervosa apice longe sensim acuminata, marginibus costaque subtus acumen versus ac in acumine ipso crebre pungenti-spinulosis. *Culmus* usque 67 cm. longus (forsan longior), 2·5–5·5 mm. latus, valde trigonus, angulis dimidio superiore et praesertim prope apicem spinuloso-scabridis spinulis nonnunquam detersilibus. *Bracteae* sub capite tres; maxima ima

---

*Continued from *K.B.* 1933, 400.

foliis similis basi vaginans, 0·6–1·1 m. longa, 4·4–6 cm. lata; secunda atque summa minor magnitudine valde variabili, intermedia nonnunquam anguste elliptica; summa 6–30 cm. longa, 0·35–3·2 cm. lata; omnia ut folia sensim acuminata marginibus apicem versus scabridis. *Caput* 3–4·5 cm. diametro, e spicis castaneis pluribus ut videtur 20–30 constans. *Spicae* ovoideae, 1–1·5 cm. longae, 3–7 mm. diametro. *Glumae* ovato-lanceolatae, dorso lineato-carinatae, 7 mm. longae, 3–3·2 mm. latae. *Squamellae* spiculae 4, 7–7·2 mm. longae; 2 laterales (vel flores masculi) complicato-naviculares, carina dorsali fere laevi sparsissime tantum spinuloso-hispidula (spinulis vulgo 1–2 tantum); squamella posterior anteriorque multo angustior, plana. *Stamina* 2, in squamellis lateralibus inclusa, antheris 2·2–3·5 mm. longis. *Stylus* ramis 2 linearibus ad 3 mm. longis. *Nux* sessilis, obovoideo-subglobosa vel subglobosa, ad 1·2 mm. alta atque diametro, laevis.

BRITISH GUIANA. Conawarook River, Sept. 1905, *Bartlett* in *Bot. Gard. Herb.* 8242 (typus in Herb. Kew.).

The Conawarook (Konawaruk) River, where several other good plants were collected by Bartlett, flows into the Essequibo River from the south-west, a few kilometres above the confluence of the Essequibo with the Potaro.

In *M. macrophylla* the glumes and squamellae are at least 1 cm. long, and are wider at the base than those of the present species, while their colour in the dried state is a very pale brown.

Mapanea (Subgen. **Pycnocephala**) **insignis** *Sandwith*, sp. nov. [Cyperaceae]; ob bracteas interiores inflorescentiam arcte includentes, spicas inflorescentiae arctissime confertas nec ante florum lapsum oculo distinguendas, nulli speciei americanae affinis, species quasdam africanas potius revocans.

Herba foliis basi late vaginantibus. *Folia* in planta humili (in *Jenman* 972) haudquaquam typica tantum visa, circiter 30 cm. longa, 1·5 cm. lata (in planta bene evoluta verosimiliter multo longiora atque latiora), supra vaginas angustata purpurascentia, marginibus costaque subtus apicem versus pungenti-spinulosis. *Culmus* trigonus, laevis vel angulis nonnunquam apicem versus tuberculis (vel basibus spinularum) hic illic praeditis, nudus vel bractea ima a ceteris 1·5–9 cm. ita sejuncta ut culmus monophyllus videatur. *Bracteae* numerosae, ut videtur 7–8, exteriores longissimae apice longe acuminatae marginibus costaque subtus nisi basin versus spinuloso-scabridis, extima ad 87 cm. longa, 4·2–5 cm. lata; interiores inflorescentiam arcte includentes, breviter late ovatae vel suborbiculares, cuspidatae, intimae inflorescentiam subaequantes. *Caput* 1·5–4·8 cm. diametro, spicis sub anthesi arctissime confertis erectis aequilongis globum singulum formantibus neque singillatim distinguendis, verosimiliter circiter 20. *Glumae* oblongo-lanceolatae, hyalino-membranaceae, 9–11 mm. longae, ad 3 mm. latae, saepe subcurvatae. *Squamellae* spiculae 4, 9–11 mm. longae; 2 laterales complicato-naviculares, carina dorsali ut videtur omnino laevi;

squamella posterior anteriorque multo angustior, plana, utraque nonnunquam cum laterali coalita. *Stamina* 3, in squamellis lateralibus ac anteriore inclusa; antherae 2·2–3 mm. longae, demum conspicue exsertae. *Stylus* ramis 2 linearibus 4·2–6 mm. longis. *Nux* immatura tantum visa, oblonga, apice in stylum attenuata, vix 1 mm. longa, circiter 0·25 mm. lata, plana.

BRITISH GUIANA. Potaro River, Oct. 1898, *Jenman* 7478 (typus in Herb. Kew.). In forest below the Kaieteur, Potaro River, Sept.–Oct, 1881, *Jenman* 972.

The inflorescence recalls that of the Tropical African species *M. Diestelii* K. Schum., *M. subcomposita* C. B. Clarke and *M. oblonga* C. B. Clarke.

Carludovica angustissima *Sandwith*, sp. nov. [Cyclanthaceae]; ad *Sectionem Primam* cl. *Gleasoni* in Bull. Torr. Bot. Club. 56, 2 (1929) pertinens, *C. pygmaeae* Gleason affinis, petiolis multo longioribus, foliorum segmentis longis perangustis, lobis perianthii masculi triangulari-lanceolatis insigniter glanduloso-punctatis differt; a *C. insulari* Gleason atque *C. nana* Gleason inter alia foliorum segmentis perangustis, staminibus paucioribus distinguenda.

Herba terrestris, foliis basalibus secus caudicem circiter 4–6 cm. longum arcte dispositis. *Folia* 14–15, ut videtur recta, basi ipsa breviter late vaginantia, tum petiolis circiter 26–28 cm. longis ad 2 mm. latis rigidis supra canaliculatis acutissime marginatis subtus obtuse carinatis praedita; lamina circiter 3–4 cm. supra basin bipartita, segmentis linearibus perangustis apicem versus longe attenuatis 24–30 cm. longis 5·5–7 mm. tantum latis. *Pedunculi* evidenter complures, graciles, 9·5–20 cm. longi. *Spathae* 4 (an semper?) apicales; 2 exteriores lanceolatae, sensim longe acuminatae, 1·9–3·5 cm. longae, extima nonnunquam pedunculo 2–3 mm. infra apicem affixa; 2 interiores spadicem includentes ovatae, ad 1·7 cm. longae, circiter 8 mm. latae, apice acumine vel cuspide 3–5 mm. longa praeditae. *Spadix* 0·8–1·2 cm. longa, 4–8 mm. diametro. *Flores masculi* huius sectionis typici; pedicelli late complanati, circiter 0·5 mm. longi atque 0·8 mm. lati; perianthium fere planum, 1·8–3 mm. diametro, ut videtur semper 5-lobum; lobi inaequales, anguste triangulari-lanceolati, apice ipso obtusiusculo, 0·5–0·8 mm. longi, maculis brunneis insigniter copiose glanduloso-punctati; discus centralis lobis rotundatis vel truncatis quam lobis perianthii multo brevioribus circiter 0·3 mm. longis atque 0·5 mm. latis; stamina 4–8, lobis disci per filamenta gracillima valde obscura vix 0·2 mm. longa affixa, loculis oblongis divergentibus 0·5–0·6 mm. longis. *Flores feminei* sessiles, quadrati, circiter 2·2 mm. longi atque lati; lobi perianthii 4, erecti, ovario adpressi, truncato-quadrati, 1 mm. alti, 2·2 mm. lati, staminodiis longis filiformibus praediti; ovarium lobis obovatis, stigmatibus cruciformibus linearibus.

BRITISH GUIANA. Holmia, Potaro River, Nov. 1907, *Bartlett* in *Bot. Gard. Herb.* 8740 (typus in Herb. Kew.): on wet rocks in a creek. Holmia is a good locality on the upper Potaro, about 26 kilometres S.S.W. of the Kaieteur Fall.

LXIV—NOTES ON AFRICAN GRASSES : XIV.*

C. E. Hubbard.

Elionurus Trapnellii *C. E. Hubbard*, sp. nov.; affinis *E. Welwitschii* Rendle, sed spiculis sessilibus latioribus, gluma inferiore inter carinas ciliolatas 10–13-nervi differt.

Gramen perenne, dense caespitosum, usque ad 1 m. altum. *Culmi* erecti, validiusculi, leviter compressi, uno latere canaliculati vel inferne applanati, rigidi, 5–7-nodes, ramosi, ramis erectis gracilibus, racemos versus et angulis nodos superiores versus minute scaberuli hic praeterea nonnunquam rigide ciliati, ceterum glabri laevesque. *Folia* subglauca; vaginae teretes, striatae, internodiis breviores, basales subpersistentes, usque ad 14 cm. longae, basin versus pilis longis deciduis laxe pilosae, ceterae glabrae laevesque; ligulae truncatae, brevissimae, glabrae; laminae angustissime lineares, apice tenuiter acutae, usque ad 60 cm. longae, planae vel siccitate convolutae, usque ad 5 mm. latae, rigidiusculae, supra arcte nervosae, pilis minutis pone ligulam exceptis glabrae, marginibus et costa media superne minute scaberulae. *Racemi* usque ad 11 cm. longi, stricti vel leviter flexuosi, pallide virides vel purpureo-tincti; articuli rhacheos lineares, usque ad 4·5 mm. longi, tarde et oblique disarticulati, superne pilis minutis appressis pubescentes; pedicelli articulis subsimiles, sed angustiores, subfiliformes, fere glabri, minute scaberuli. *Spiculae sessiles* plerumque 5–7 mm. longae (callo excluso); callus 1–2 mm. longus, basi rotundata obscure et minutissime barbatus. *Glumae* subaequales; inferior explanata lanceolata vel anguste ovata vel anguste elliptico-ovata, acuminata, apice minute bidentata, dorso glabra, inter carinas obscure 10–13-nervis, carinis angustissime alatis et dense et rigide ciliolatis; superior inferiore paulo brevior, lanceolata, acuta, 3-nervis, carina minutissime pubescente, marginibus obscure et minute ciliolatis. *Anthoecium inferum* sterile: lemma lanceolatum vel anguste oblongo-lanceolatum, acutum, 2-nerve, marginibus minute ciliolatis; palea nulla. *Anthoecium superum* ☿: lemma lemmati anthoecii inferi simile sed 3–3·5 mm. longum et 3-nerve; palea nulla. *Spiculae pedicellatae* illis sessilibus subsimiles sed angustiores et breviores, 4–4·5 mm. longae. *Gluma* inferior lanceolata, apice integra, 6–7-nervis, dorso obscure et minute asperula, altero margine rigide ciliolata, altero scabrida. *Anthoecium superum* ♂. *Antherae* 2–3 mm. longae.

Northern Rhodesia: Mazabuka, Central Research Station, *Albizzia struthiophylla* country, in sandy loam soils, 1140 m., Jan. 1932, *Trapnell* 846 (type), 874.

Brachiaria stipitata *C. E. Hubbard*, sp. nov.; affinis *B. callopo* (Pilger) Stapf, sed culmis et foliis multo brevioribus et gracilioribus, racemis usque ad 4, rhachi glabra, spiculis minoribus differt.

Gramen annuum, gregarium, usque ad 36 cm. altum. *Culmi* erecti, e nodis inferioribus radicantes, siccitate compressi, graciles, basin

---

*Continued from *K.B.* 1933, 269.

versus ramosi, superne simplices, usque ad 4-nodes, racemos versus tenuiter striati, nodis appresse pubescentes, ceterum glabri laevesque. *Foliorum vaginae* compressae, carinatae, sublaxae, striatae, internodiis longiores, laeves, basales pilis appressis paucis exceptis glabrae vel plerumque totae glabrae; ligulae ad seriem pilorum minutorum redactae; laminae lineares, erectae, apice subobtusae, usque ad 10 cm. (vel ultra) longae, arcte conduplicatae et carinatae, explanatae usque ad 5 mm. latae, supra basin versus pilis appressis mollibus paucis exceptis glabrae, marginibus et carina apicem versus minute scaberulae. *Inflorescentia* erecta, usque ad 7·5 cm. longa; axis primarius scaberulus, inferne dorso rotundatus et striatus, facie canaliculatus vel plerumque totus triqueter. *Racemi* 2–4, simplices, erecti, subsessiles, secundi, dense spiculati, biseriati, 2·8–0·8 cm. longi, inferiores usque ad 3 cm. distantes; rhachis subtriquetra, usque ad 0·6 mm. lata, dorso subcomplanata, glabra, marginibus scaberulis; pedicelli solitarii, brevissimi, scaberuli, apice discoidei. *Spiculae* contiguae, dorso late ellipticae vel late elliptico-ovatae, acutae, 3·5–4 mm. longae, turgidulae, stipitatae, stramineae; internodium inferum (stipes) rhachillae globosum, usque ad 0·5 mm. longum. *Glumae* basi stipiti adnatae; inferior oblata, subacuta, usque ad 1·8 mm. longa, membranacea, 5-nervis; superior valde convexa, spiculae subaequilonga et ambitu similis, membranacea, 5-nervis, nervis scabridis, apicem versus transverse nervata, superne minute asperula. *Anthoecium inferum* ♂, spiculae aequilongum: lemma glumae subsimile, dorso longitudinaliter late sulcatum, 5–7-nerve; palea lemmati aequilonga, apice minute pubescens. *Anthoecium superum* ⚥, infero subaequilongum, dorso late ellipticum, subacuminatum, apiculatum, apice minute pubescens: lemma et palea crustacea, nitens, straminea. *Antherae* usque ad 1 mm. longae.

French Guinea: between Mamou and Dalaba, in a swamp. *Chevalier* 34598.

Urochloa geniculata *C. E. Hubbard*, sp. nov.; affinis *U. brachyurae* (Hack.) Stapf, sed spiculis ovatis vel elliptico-ovatis dense et minute pubescentibus, gluma superiore 7–9-nervi differt.

Gramen annuum, usque ad 80 cm. longum. *Culmi* geniculato-adscendentes, e nodis inferioribus radicantes, simplices vel plerumque basin versus ramosi, usque ad 6-nodes, nodis dense pilosis, nodos versus pilis e tuberculis ortis laxe pilosi, inflorescentiam versus dense pilosi. *Foliorum vaginae* demum internodiis breviores, laxae, striatae, apicem versus carinatae, pilis e tuberculis ortis sublaxe pilosae vel marginibus ciliatis exceptis glabrescentes; ligulae ad seriem ciliorum densorum redactae; laminae lineares, basi contractae, apice tenuiter acutae, usque ad 25 cm. longae et usque ad 10 mm. latae, planae, subtenues, virides, pilis e tuberculis ortis laxe pilosae, marginibus cartilagineis scabridis et inferne ciliatis. *Inflorescentia* angusta, 7–10 cm. longa; axis primarius dense pilosus, inferne semiteres, superne complanatus. *Racemi* 5–6, dense spiculati, erecti vel leviter patentes, secundi, sessiles vel subsessiles, usque ad 5·5 cm. longi, inferiores 2–2·5 cm. distantes; rhachis dorso plana, circiter 1–1·5 mm. lata, subtriquetra, marginibus ciliolata et pilis longis albis e tuberculis ortis laxe adspersa; pedicelli bini, inaequales, usque ad 1 mm. longi, apice discoidei. *Spiculae* dense imbricatae, ovatae vel elliptico-ovatae, acute acuminatae, 4–5 mm. longae, minute pubescentes, pallide virides. *Glumae* membranaceae, pilis minutis densis e tuberculis minutis ortis pubescentes; inferior lanceolata vel anguste ovata, obtusa vel truncata, 3–4 mm. longa, 5–7-nervis; superior explanata ovata, obtusa, spiculae aequilonga, 7–9-nervis. *Anthoecium inferum* ♂: lemma glumae superiori simile sed dorso planum, acuminatum, 5-nerve; palea elliptica, 4 mm. longa, carinis angustissime alatis. *Anthoecium superum* ⚥, dorso late ellipticum, 3–3·3 mm. longum: lemma coriaceum, granulare, rugulosum, mucrone barbellato usque ad 1·5 mm. longo; caryopsis suborbicularis, dorso valde compressa, 2 mm. longa.

TANGANYIKA TERRITORY: Lake Province, Kwimba District, near dwellings and in cultivated land, *Marshall* 5.

Urochloa novemnervia *C. E. Hubbard*, sp. nov.; affinis *U. brachyurae* (Hack.) Stapf, sed rhachi racemorum glabra vel fere glabra, spiculis majoribus minute pubescentibus, glumis 9–11-nervibus differt.

Gramen annuum, laxe caespitosum, usque ad 30 cm. altum. *Culmi* geniculato-adscendentes, graciles, teretes, infra medium ramosi, ramis suberectis, circiter 4-nodes, striati, nodos versus et internodio supremo (pedunculo) pilis patentibus hirsuti. *Foliorum vaginae* laxae, striatae, apicem versus carinatae, pilis patentibus e tuberculis ortis laxe hirsutae vel superiores marginibus dense ciliatis exceptis glabrae et laeves, inferiores internodiis longiores, superiores demum breviores; ligulae ad seriem ciliorum redactae; laminae anguste lanceolatae, basi abrupte contractae vel leviter rotundatae, in apicem callosum obtusum attenuatae, usque ad 8 cm. longae, 5–10 mm. latae, planae, rigidae, virides, pilis plerumque e tuberculis ortis sparse hirsutae vel glabrescentes, marginibus cartilagineis scaberulis. *Inflorescentia* 3·5–6 cm. longa; axis primarius usque ad 5 cm. longus, inferne semiteres et plus minusve dense hirsutus, superne complanatus, scaberulus, pubescens vel glabrescens. *Racemi* usque ad 5, leviter patentes, stricti vel plerumque flexuosi, simplices, secundi, sessiles vel subsessiles, inferiores usque ad 3·5 cm. longi, superiores breviores; rhachis complanata vel superne triquetra, circiter 1 mm. lata, glabra vel marginibus pilis paucis rigidis longis raro adspersa, marginibus scabrido-ciliolata; pedicelli solitarii vel inferne bini, usque ad 1 mm. longi. *Spiculae* laxe imbricatae vel leviter patentes et contiguae, lanceolatae, anguste ovatae vel ovatae, acute acuminatae, 5·5–6·5 mm. longae, pallide virides, minute pubescentes. *Glumae* chartaceae, pilis minutis densis e tuberculis minutis ortis pubescentes; inferior lanceolata vel late lanceolata vel anguste lanceolato-oblonga, obtusa, 4·5–5·5 mm. longa, arcte

9-nervis, nervis superne anastomosantibus; superior explanata ovata, obtusa, spiculae aequilonga, 9–11-nervis. *Anthoecium inferum* sterile: lemma glumae superiori simile sed dorso planum vel leviter concavum, acuminatum, 5–7-nerve; palea elliptica, obtusa, 4 mm. longa, membranacea, carinis angustissime alatis. *Anthoecium superum* ⚥, dorso ellipticum, circiter 4 mm. longum, pallide viride: lemma coriaceum, granulare, rugulosum, mucrone usque ad 1·3 mm. longo; antherae 0·8 mm. longae.

TANGANYIKA TERRITORY: Lake Province, Kwimba District, *Marshall* 6.

Panicum glaucocladum *C. E. Hubbard*, sp. nov.; affinis *P. membranaceo* Robyns, sed culmis infra medium multum ramosis, laminis lanceolatis, spiculis pubescentibus minoribus differt.

Gramen annuum, usque ad 36 cm. altum. *Culmi* geniculato-adscendentes, e nodis inferioribus radicantes, gracillimi, teretes, usque ad 9-nodes, infra medium multo ramosi, ramis erectis vel patentibus, pruinosi, glabri laevesque, internodiis inferioribus usque ad 2 cm. longis, internodio supremo (pedunculo) usque ad 13 cm. longo. *Foliorum vaginae* internodiis breviores, teretes, laxae, inferiores breviter pilosae, superiores glabrescentes vel glabrae; ligulae ad seriem ciliorum redactae; laminae anguste lanceolatae vel lanceolatae, basi rotundatae, apice acute acuminatae, 1·5–3 cm. longae, 3–9 mm. latae, planae, tenues, tenuiter nervosae, laxe pubescentes, marginibus ad basin ciliatae superne scaberulae. *Panicula* late obovata vel late obovato-elliptica, laxissima, tripinnata, usque ad 9 cm. longa et 6 cm. lata, erecta; rhachis filiformis, longitudinaliter sulcata, laevis; rami oblique patentes, e basi divisi, tenuiter filiformes, laeves, leviter flexuosi, inferiores usque ad 6 cm. longi; ramuli et pedicelli patentes, capillares, laeves: pedicelli 1–7 cm. longi. *Spiculae* ovatae, acutae vel subobtusae, circiter 1·3 mm. longae, breviter pubescentes, pallide virides et purpureo-variegatae. *Glumae* tenuiter membranaceae, pilis brevibus patentibus pubescentes; inferior explanata ovata, acuta, circiter 1 mm. longa, 3-nervis; superior explanata late elliptico-ovata vel late elliptica, obtusa, spiculae aequilonga, 5-nervis. *Anthoecium inferum* sterile: lemma glumae superiori simile sed glabrum; palea elliptica, lemmati aequilonga. *Anthoecium superum* ⚥, dorso ellipticum, subacutum, circiter 0·8 mm. longum, albidum: lemma et palea tenuiter papyracea, obscure verruculosa. *Antherae* 0·5 mm. longae.

SIERRA LEONE: near Toma, Bonthe Island, common along sandy roads in light shade of oil palms, Nov. 1931, *Deighton* 2282.

The very small spikelets serve to distinguish this graceful plant from the remaining annual species of the section *Verruculosae* which occur in tropical Africa.

Ehrharta longigluma *C. E. Hubbard*, sp. nov.; a ceteris speciebus differt glumis lemmatibus multo longioribus.

Gramen perenne, caespitosum, 45–50 cm. altum. *Culmi* suberecti vel basi leviter geniculati, graciles, teretes, simplices, 2–3-nodes, nodis pilis minutis appresse pubescentes, internodiis inferioribus minute et obscure puberuli, ceteris glabri et laeves. *Foliorum vaginae* teretes, basales internodiis longiores, obscure et dense puberulae vel demum glabrae, intermediae et superiores internodiis breviores, asperulae; ligulae truncatae, laceratae, usque ad 1 mm. longae, membranaceae; laminae lineares, apice obtusae et callosae, usque ad 8 cm. longae et 2 mm. latae, planae vel siccitate involutae, rigidiusculae, dense et minute pubescentes. *Panicula* ambitu ovata, laxissima, 10–13 cm. longa; rhachis gracillima, flexuosa, laevis; rami solitarii vel bini, distantes, tenuiter filiformes, flexuosi, simplices, paucispiculati, demum patentes, laeves; pedicelli subcapillares, laeves, superne leviter incrassati, laterales usque ad 10 mm. longi, terminales usque ad 18 mm. longi. *Spiculae* nutantes, lanceolato-oblongae vel anguste oblongae, 6–7·5 mm. longae, glabrae, inferne purpurascentes et virides, superne flavido-virides. *Gluma* inferior ambitu lineari-lanceolata, obtusa, explanata anguste oblongo-lanceolata, apice rotundata, spiculae aequilonga, firme membranacea, 7–8 nervis; gluma superior inferiori similis sed paulo brevior. *Lemma sterile inferius* explanatum elliptico-oblongum, apice rotundatum, 3 mm. longum, coriaceum, obscure 3-nerve. *Lemma sterile superius* naviculare, ambitu semi-elliptico-oblongum, apice oblique obtusum, 4 mm. longum, coriaceum, 5-nerve, basi appendiculatum, appendiculis suborbicularibus circiter 0·7 mm. longis. *Lemma fertile* explanatum late ellipticum, apice rotundatum, circiter 3·6 mm. longum, 7-nerve, coriaceum; palea angusta, lemmati aequilonga, hyalina. *Antherae* 2·5 mm. longae.

NATAL: Mont aux Sources, common in grassland on mountain-slopes, 3150 m., Feb. 1926, *Bayer & McClean* 270.

A very distinct species, readily separated from all other species by its long glumes which considerably exceed the florets.

Brachyachne fibrosa *C. E. Hubbard*, sp. nov.; affinis *B. fulvae* Stapf, sed foliorum laminis angustioribus, spiculis brevioribus, glumis angustioribus differt.

Gramen perenne, dense caespitosum, 30–45 cm. altum. *Culmi* erecti, basi vaginis dense obtecti, gracillimi, teretes, simplices, 2–3-nodes, nodis atrofuscis, glabri laevesque. *Foliorum vaginae* basales basin versus dense sericeo-villosae, ceterum glabrae laevesque, in fibras demum fissae, ceterae internodiis breviores, arcte appressae, tenuiter striatae, ore pilis brevibus exceptis glabrae laevesque; ligulae truncatae, brevissimae, glabrae; laminae anguste lineares vel filiformes, tenuiter acutae, inferiores usque ad 14 cm. longae, ceterae multo breviores, arcte convolutae vel involutae vel explanatae et usque ad 1·5 mm. latae, rigidae, virides, supra basin versus pilis paucis longis exceptis glabrae laevesque. *Racemi* 3–5, digitati, spiciformes, stricti, demum patentes, 2·5–3·5 cm. longi, graciles, a basi spiculigeri, fulvi; rhachis gracillima, dorso applanata, 0·5 mm.

lata, marginibus minute scaberulis; pedicelli minutissimi. *Spiculae* arcte imbricatae, alternae, appressae, anguste oblongae, demum hiantes, lateraliter valde compressae, 3·5–4 mm. longae. *Glumae* subaequales, angustae, carinatae, membranaceae, uninerves, glabrae; inferior spiculae aequilonga, explanata lanceolata vel anguste oblongo-lanceolata, obtusa, carina minute scaberula; superior inferiore paulo brevior, explanata anguste elliptico-oblonga, apice rotundata, carina superne minute scaberula. Lemma carinatum, explanatum elliptico- vel ovato-oblongum, usque ad 3 mm. longum, apice truncatum vel leviter emarginatum, 3-nerve, nervo medio in mucronulum usque ad 0·3 mm. longum excurrente, e nervis molliter ciliatum, tenuiter membranaceum; palea angusta, lemmate paulo brevior, glabra, carinis minute scaberulis; rhachilla usque ad 1·5 mm. longitudinem producta.

TANGANYIKA TERRITORY: Iringa Province, Msima Stock Farm, common in patches on hillsides, 1932, *Emson* 349.

The genus *Brachyachne* is now represented in tropical Africa by four species. *B. fulva* Stapf and *B. fibrosa* C. E. Hubbard have digitate spikes, whilst **B. obtusiflora** (*Benth.*) *C. E. Hubbard*, comb. nov. (*Microchloa obtusiflora* Benth.) and **B. patentiflora** (*Stent et J. M. Rattray*) *C. E. Hubbard*, comb. nov. (*Microchloa patentiflora* Stent et J. M. Rattray) have solitary spikes.

LXV—MISCELLANEOUS NOTES.

Sixth International Botanical Congress, 1935. The dates of the Congress have been altered and are now September 2nd-7th, 1935. A preliminary notice has already been sent to a number of botanists. Additional copies can be obtained from the Secretary, Dr. M. J. Sirks, Wageningen, Holland.

Ulmus campestris *Linn.* Article 67 of the "British Proposals," which was adopted at the Fifth International Botanical Congress at Cambridge in 1930, states that "A name of a taxonomic group must be rejected if, owing to its use with different meanings, it becomes a permanent source of confusion or error." A list of names to be rejected for this reason (*nomina ambigua*) is to be drawn up and appended to the Rules as Appendix V.

In Notes from the Univ. Herb. Cambridge, No. 4, in Journ. Bot. **70,** Suppl. p. 23 (1932) we stated that, in our opinion, "*U. campestris* should be abandoned as a *nomen confusum.*" (The term *nomen ambiguum* should have been used instead of *nomen confusum,* which applies to a group whose characters are "derived from two or more entirely discordant elements.") We put forward this view because we considered that the name *U. campestris* Linn. had been used by a sufficient number of authors in different senses to necessitate its rejection. Thus Ascherson & Graebner, Syn. Mitteleurop. Fl. **4,** 552 (1911) and other continental authors apply it to *U. nitens* Moench; Sowerby & Smith, Engl. Bot. **27,** t. 1886 (1808) and Smith, Engl. Fl. **2**, 21 (1824) to *U. minor* Mill. sec. Henry ; Kerner in Oest. Bot. Zeit. **26**, 52 (1876) to *U. glabra* Huds. ; Moss, Camb. Brit. Fl. **2**, 94, tt. 103, 102 (1914), and many British botanists to *U. procera* Salisb. (the English Elm), as was done by Linnaeus in the "Flora Anglica" (but not in the "Species Plantarum") where he cited Ray's reference to *U. vulgatissima folio lato scabro* Goodyer (undoubtedly the English Elm) under the name *U. campestris.* The specimen in the Linnean Herbarium has been referred to *U. glabra* Huds., but may be a hybrid of that species with *U. nitens* Moench. For these reasons we here suggest the name *Ulmus campestris* Linn. for inclusion in the list of *nomina ambigua.* If this is done, the first post-Linnean name of definite application to the English Elm, as has been shown by Rehder in Journ. Arn. Arb. **1**, 138 (1919), is *U. procera* Salisb. Prodr. Hort. Chapel Allerton, 391 (1796).

W. T. S. & J. S. L. G.

Indian Timbers.*—In view of the vast extent and economic importance of the forests of India, the appearance of an authoritative and up-to-date account of 320 of the more important commercial timbers of that country is a matter of considerable interest. Hitherto the standard work on the subject has been the well-known "Manual of Indian Timbers" by J. S. Gamble, but even the most recent edition of that work is in many respects out of date.

The authors state in the introduction that their aim is to bring together all the available information on the uses and qualities of the various timbers, and to make photomicrographs of low and high magnifications generally available, especially to forest officers. The subject matter dealing with the various woods is arranged as in the Genera Plantarum, except that the *Coniferae* are dealt with at the end. Certain other minor alterations have also been made, e.g. the genus *Chloroxylon* has been transferred from the *Meliaceae* to the *Rutaceae* and inserted next to the genus *Aegle,* "a step which is acceptable to systematists and is further borne out by the structure of the wood."

Under each family, general information relating to its woods, distribution throughout the world, significance in the Indian flora, economic importance, and its more salient structural characters is given. The genera and species are similarly treated, the anatomical descriptions under the species being very thorough and complete. There are two keys for the identification of species (based on characters visible with the hand lens and microscope respectively) in genera where more than one species is of sufficient economic importance to have been included in the book. Since there is often considerable variation in the structure of the wood of a single species, it is perhaps unfortunate that the descriptions of the wood of the different species have, in some instances, been based on a study of a single specimen. The mechanical properties, seasoning, durability, antiseptic treatment, and working qualities, together with the present and prospective uses of the different woods are discussed.

---

*Commercial Timbers of India, their Distribution, Supplies, Anatomical Structure, Physical and Mechanical Properties and Uses. By R. S. Pearson and H. P. Brown. Published by the Government of India Central Publication Branch, Calcutta, 1932. Pp. xliv+1150, 640 photomicrographs, 320 distribution maps. 2 vols. Price £5 net.

Trade names have, wherever possible, been taken from the list recently issued by the Government of India for use of forest officers, but owing to the fact that timber merchants, and especially those in Europe, have coined names to suit their own purposes, the authors state that they have in many cases experienced great difficulty in assigning names. Vernacular names are given and have been arranged according to the Provinces.

A very important feature of the book, and one which greatly enhances its value, is the illustrations. These consist of a small map showing the distribution of each of the species described, a photograph of a transverse surface of the wood magnified ten times, showing the characters that may be recognised with a hand lens, and one of a transverse section of the wood of each species magnified by 110. It is, however, to be regretted that illustrations of tangential sections have been omitted. These are especially useful when a wood of unknown origin has to be identified.

There is an appendix giving a classification of the timbers according to their uses arranged under thirty-three headings such as "construction and general carpentry," "ship and boat building," "railway sleepers," etc. A second appendix gives a glossary of scientific terms and phrases used in the book. There is also a general bibliography, and the trade, vernacular and scientific names are indexed separately.

The authors, printers and publishers are to be congratulated on having produced a book worthy to become the standard work on Indian timbers, and one which will be indispensable to all who are interested in the structure, properties and uses of wood. C. R. M.

Spices and Condiments.*—There seems to be no precise definition of the distinction between a spice and a condiment. Under the term spice the author includes in this book a variety of dried vegetable products containing essential oils which are used for flavouring food, excluding herbs and aromatic seeds, and decides to use the word condiment to denote "a spice, or other seasoning material . . . added to food after it has been served at table." An idea of the scope of the work is given in the statement: "Although the book has been written primarily for those whose interest in Spices centres in the fact that the flavours of these products enhance the attractiveness of food, whether they be grocers, food and flavouring essence manufacturers, housewives, chefs, or gourmets, it has not been forgotten that Spices are used also as drugs and as perfumes."

---

*By H. Stanley Redgrove, B.Sc., F.I.C., published by Sir Isaac Pitman & Sons, Ltd., London, 1933. Pp. 361+xviii, illustrated. Price 15*s*.

The principal market of the world for " spices from the East " is London, with Mincing Lane as the business centre, where certain firms who specialize in these pleasant commodities have been established for generations. The history of the trade runs parallel with that of travel and early colonization, centred on the Moluccas or Spice Islands, which were chiefly concerned with cloves, nutmegs and mace. The importance of these Islands began in 1510 when the Portuguese, who included also cinnamon from Ceylon in their commerce, took possession of them. Later, they came in turn under the control, either by force or by treaty, of the Dutch about 1610, the British in 1796, and in 1814 were restored to the Dutch, which nation is still in possession. The British East India Company, when first chartered by Queen Elizabeth in 1600, appears to have relied largely on spices for a revenue. Prior to this the eastern trade overland from India, China, etc., to the Mediterranean in ginger, pepper, cardamoms, cassia bark and various minor spices, such as caraway and coriander, was largely in the hands of the Arabs and Persians, and considerable ignorance prevailed as to the true sources, both botanical and geographical. The great fortunes reported to have been made by the spice merchants of the Classic and Mediaeval Ages were no doubt largely responsible for keeping the sources obscure.

In the first chapter, on " The Philosophy of Spice," the author deals with flavour, taste, medicinal value and other general subjects. In the remainder of the book the plants dealt with are classified under rhizome and root, bark, flower, fruit and seed spices, and information under such headings as history, cultivation and uses is given.

The author discusses the long-standing question of the specific source of " Black Caraway " (" Shiyah Zirah "), a *Carum* that has been of importance in India for a hundred years or more, but little known in this country. The fruit is collected from wild plants for local use in India, Persia, Kashmir and other countries. Similar uncertainty as to the botanical origin has often been met with in the case of products obtained from wild sources or plants not in general cultivation. To quote another instance, the rhizome of the " Lesser Galangal " (*Alpinia officinarum* Hance), though rarely used now, was well-known as a spice during the Middle Ages in Europe, but the plant was not discovered until 1867. Quoting from Ridley (Spices, 439), in the present work the author states that the earliest reference to this spice is that of Ibn Khurdabah, the Arabian geographer, A.D. 869–885, and that the plant was first found by Theophilus Sampson at Tung-sai on the peninsula of Lei-chau-fu, opposite Hainan in the south of China, but apparently only as an escape from cultivation. The specific name given to it by Dr. Hance was first published in the Journal of the Linnean Society in 1872.

An extensive bibliography is added, and it is noticeable that both American and British books on spices are very limited, the present one being the second published in the United Kingdom. Mr. H. N. Ridley's book, the first of the two, published in 1912 (see Kew Bull. 1912, 353), is, as agreed by the author of the work under review, " a classic work," but Mr. Redgrove's hope that " the present work, in which something approximating to a comprehensive account has been attempted, will satisfy a very real need " shows every promise of being realized.

J. H. H.

A Hong Kong Biological Journal.—Under the title of The Hong Kong Naturalist,* a quarterly illustrated journal was commenced in January 1930 for circulation in Hong Kong and South China. The journal, which embraces all branches of natural history, has already covered a wide range of subjects and includes not only notes and semi-popular articles but a number of scientific papers. Some of these are of the nature of critical systematic revisions and recently two supplements, containing the more purely scientific contributions, have been issued separately.

Amongst the papers contributed are two important series on the birds and fishes of Hong Kong. On the botanical side the six following papers on the Hong Kong flora have appeared or are in course of publication : The Orchids, by G. A. C. Herklots ; The Marine Algae, by W. A. Setchell ; Flowering Shrubs and Trees, by G. A. C. Herklots ; The Mosses, by H. N. Dixon ; The Parasitic Mycetozoa, by W. R. Ivimey Cook ; and Balania Harlandii (Hook. f) Van Tiegh. and its relatives, by W. A. Setchell.

The work, which is now under the able and energetic editorship of Dr. G. A. C. Herklots, Reader in Biology in the University of Hong Kong, is well got up and profusely illustrated by drawings and good photographs, whilst a few of the flowers and more than 20 of the birds are portrayed in excellent coloured plates prepared from drawings by Lieut. Commander A. M. Hughes and reproduced by the Cambridge University Press. The numbers issued during the first years of its existence reflect great credit on the Editors and we wish the journal every success.

Flora of the South Indian Hill Stations : OOTACAMUND, COONOOR, KOTAGIRI, KODAIKANAL, YERCAUD AND THE COUNTRY ROUND.†—The author of the " Flora of the Nilgiri and Pulney Hill-Tops," published in two volumes in 1915 with a supplementary one in 1920, has revised and amplified that work under the above title.

---

*The Hong Kong Naturalist, edited by G. A. C. Herklots. The Newspaper Enterprise Limited, Hong Kong. Prepaid subscription $7.00 per annum post free ; Europe, 12s. 6d. ; America $3.00 (gold) per annum post free.

†By P. F. Fyson, Principal, Presidency College, Madras. Printed by the Superintendent, Government Press, Madras, 1932, 2 vols. Price Rs. 18.

Though still issued in two volumes (one of text and the other of illustrations), the scope of the work has been extended to include Yercaud in the Shevaroy Hills and Coonoor in the Nilgiris. The same plan is followed, but the number of species of flowering plants included has increased from 483 to 877 and there are 611 full-page plates, which include all but 20 of those in the earlier work and 60 new ones. Many of the descriptions have been revised, the keys to families and genera recast, and all the new species described since 1920 have been included. The taxonomy has, for the most part, been brought into line with those parts of the Flora of the Presidency of Madras that have appeared in the interval. In the Gramineae the author has now split up the genus *Andropogon* (as accepted in the Flora of British India) into some of the genera segregated from it according to modern conceptions. The full division, however, as laid down by Dr. Stapf in the Flora of Tropical Africa, has not been followed; e.g. *Amphilophis* and *Capillipedium* are omitted and the generic divisions of *Panicum* are not accepted. On page xv appears a list of " Changes in names of genera " from the earlier work, but neither *Parthenocissus* for *Vitis* in part, nor *Moonia* for *Chrysogonum*, is mentioned.

These small inconsistencies, however, detract very little from a work that should prove even more useful and stimulating to both amateur and professional botanists than the now superseded earlier edition.

C. E. C. F.

Botanical Magazine.—Part 4 of vol. 156 of the " Botanical Magazine," published on October 2nd, 1933, contains one new species, *Berberis tsarongensis* Stapf (t. 9332), allied to *B. Tischleri* and *B. yunnanensis* and found on the Mekong-Salween divide, N. W. Yunnan, and the following plant portraits :—

Rhododendron megacalyx Balf. f. et Ward (t. 9326), a native of N. E. Burma and S. E. Tibet; *Cymbidium Devonianum* Paxton (t. 9327), from the Sikkim and Khasia Hills; *Aeonium manriquerorum* Bolle (t. 9238), one of the Canary Island Sempervivums; *Clematis ranunculoides* Franch. (t. 9329), an interesting species from northern Yunnan; *Chrysanthemum Makinoi* Matsumura et Nakai (t. 9330), from Southern Hondo, Japan—the article contains a valuable account by the late Dr. Stapf on the species which have been concerned in the production of the Garden Chrysanthemum; *Allium Beesianum* W. W. Smith (t. 9331), a fine blue-flowered species from China; *Iris Helena* K. Koch (t. 9333), from Azerbaijan; *Cynoglossum amabile* Stapf et Drummond (t. 9334), from China; *Discaria crenata* Regel (t. 9335), a native of Southern Chile, and *Crossandra subacaulis* C. B. Clarke (t. 9336), a widely distributed perennial in East Africa. The volume is dedicated to Mr. Gerald Loder, and is accompanied by his portrait.

A new Flora of Leicestershire and Rutland.*—Mr. Horwood is to be heartily congratulated on bringing to successful completion a task on which he has been working for so long, but which, owing to various circumstances, had to be finally prepared for press in only eighteen months. The Flora is an attractive volume of nearly a thousand pages, illustrated with portraits, photographs of vegetation, and five maps, including a very valuable coloured geological map of the superficial deposits. Despite its length, the book is not ungainly in size, owing to the judicious use of small print and a sufficiently thin paper.

The arrangement of the matter is planned on a very generous scale. After a Preface giving the origin and history of the work, there follows an introduction of 167 pages, divided into two portions, one on Leicester and the other on Rutland. Under each county there are sections on soils, agriculture, topography, geology, river systems, botanical districts, vegetational types, meteorology and botanical research. While each section is treated very fully, those on botanical districts and vegetational types deserve special mention. The various ecological formations of each district, with full lists of species, are described, special attention being paid to Charnwood Forest and the extensive woodlands of the two counties. The ecological approach to vegetation, so noticeable in the Introduction, is stressed throughout the work, giving it a value not possessed by any other Local Flora.

Before the Flora proper, an enumeration is given of the herbaria, libraries, etc., consulted, followed by a bibliography containing some 200 entries.

The treatment of each species in the body of the work follows the accepted lines, with one notable addition, namely the geological and ecological formations, and soil, in which each species occurs. This information, neatly indicated by symbols, is perhaps the most valuable feature of the Flora and represents the results of Mr. Horwood's extensive ecological surveys over a period of many years. The full lists of localities given for many species which are widely distributed in the two counties are also very valuable, especially as work on the British Flora in the future is likely to be increasingly concerned with autecological and genetical studies of single species or genera, for which such information is particularly useful.

A detailed consideration of the individual species is not possible within the limits of a brief review. When so many are dealt with by a single author it is to be expected that specialists will quarrel with the treatment of particular groups. For example, the nomenclature of the elms, of which Mr. Horwood describes and figures a

---

*The Flora of Leicestershire and Rutland, a topographical, ecological and historical account with biographies of former botanists (1620–1933), by Arthur Reginald Horwood, F.L.S., and the late Charles William Francis Noel, 3rd Earl of Gainsborough. Oxford University Press, 1933. Pp. ccxciii + 687, illustrated with photographs and maps. Price 35*s*.

new species, *Ulmus elegantissima*, is open to criticism. On the whole, however, a task of considerable taxonomic difficulty has been very ably accomplished, and the notes on general biology after each species are of particular value. Considering the pressure under which the book was seen through the press, the number of misprints is small.

A new Flora of Leicestershire has long been needed and the present volume, which must be regarded as one of the most detailed and comprehensive Local Floras ever published, undoubtedly fills this want with conspicuous success.

Hooker's Icones Plantarum.*—Part 4 of Vol. 2 of the fifth series, which appeared in May 1933, contains descriptions and plates of twenty-five plants, including sixteen new or recently described species, two of which represent new genera.

Ascopholis C. E. C. Fischer (t. 3183) is a cyperaceous genus allied to *Mariscus* and *Ascolepis* ; it is known only from a specimen collected by the late Mr. J. S. Gamble in the Madras Presidency as long ago as 1884. *Thellungia advena* Stapf (t. 3184) was first described from a plant found growing on wool refuse near a mill at Solothurn, Switzerland : the presence of other aliens introduced from Australia led to the suggestion, since proved to be correct, that it came from that country, where it appears to have been confused with *Sporobolus elongatus* R. Br.

Three species of *Ficus* are illustrated and described : *F. glandifera* Summerhayes (t. 3188) from the New Hebrides has receptacles which, with their bracteal cups, bear a striking resemblance to acorns. This feature is less marked in *F. Watkinsiana* F. M. Bailey (t. 3187) from Queensland. *F. nasuta* Summerhayes (t. 3189) is remarkable for the proboscis-like projection of the ostiolar region and its *Tilia*-like leaves ; it is a native of the Santa Cruz Islands (between the New Hebrides and Solomon Islands).

Dorisia Gillespie (t. 3190) is an aberrant new genus of *Cornaceae* from Fiji ; it is related to *Mastixia* Bl. and the recently described *Mastixiodendron* Melch., but differs from both in the absence of a calyx-tube. *Scleria Barteri* Boeck. (t. 3191) is widely spread in dense forest in Tropical Africa from Sierra Leone to Uganda, Pemba Island and the Belgian Congo. It is remarkable among *Cyperaceae* on account of its climbing habit. The stems are sometimes as much as 20 ft. long.

Pavetta uniflora Bremekamp (t. 3194), a native of Kenya Colony, is unusual in the genus on account of its sympodial branching and solitary flowers : bacterial nodules are found in the leaves. *Cryptosepalum pseudotaxus* E. G. Baker (t. 3196) is the dominant tree of woodlands on the Kalahari sand in the Mwinilunga District of Northern Rhodesia and eastern Angola. The calyx bears three minute teeth and a single adaxial lobe, and there is but one (adaxial) petal and three stamens. *Blepharis menocotyle* Milne-Redhead (t. 3198), a native of Rhodesia, is of morphological interest because its persistent, crescent-shaped cotyledons form a false whorl with the first pair of foliage leaves. The inflorescence is frequently borne in the axils of this false whorl. The seed appears glabrous when dry, but is really densely covered with appressed hairs which become very conspicuous when it is soaked in water.

---

*Hooker's Icones Plantarum; or, figures, with descriptive characters and remarks, of new and rare plants, selected from the Kew Herbarium. Fifth Series. Edited for the Bentham Trustees by Sir A. W. Hill, K.C.M.G., Sc.D., F.R.S., Director, Royal Botanic Gardens, Kew. Vol. 2, Part 4 (London, Dulau & Co., 1933). Price 10*s*.

Pelargonium frutetorum R. A. Dyer (t. 3200), a species from eastern Cape Province, is related to *P. inquinans* L. and *P. zonale* L., two of the ancestors of our cultivated " geraniums."

The other plants figured are: t. 3176, *Dianthus rupicola* Biv. (Italy, Sicily, Crete); 3177, *Rhamnus rhodopeus* Vel. (Bulgaria, Thrace); 3178, *Rhamnus rupestris* var. *rumeliacus* Hayek (Thrace); 3179, *Teucrium creticum* L. (Asia Minor, Cyprus, Syria, Palestine); 3180, *Scilla albanica* Turrill (Albania); 3181, *Allium bidentatum* Fisch. (Siberia, China); 3182, *Allium Zimmermannianum* Gilg (China); 3185, *Pennisetum Basedowii* Summerhayes et C. E. Hubbard (Australia); 3186, *Isotoma anethifolia* Summerhayes (Australia); 3192, *Hypericum afromontanum* Bullock (East Africa); 3193, *Euphorbia Euryops* Bullock (East Africa); 3195, *Dombeya brachystemma* Milne-Redhead, sp. nov. (Rhodesia); 3197, *Oreacanthus montifuga* Milne-Redhead, sp. nov. (Rhodesia); 3199, *Sapium Acetosella*, Milne-Redhead, sp. nov. (Rhodesia).

Dunkal Gum.—This name is applied to one of the bdelliums of British Somaliland, the botanical identity of which was for a long time unknown but has now been shown to be *Commiphora Drake-Brockmanii* Sprague. It differs from the other better known bdelliums and gum-resins from Somaliland in that it is reputed to be exceedingly poisonous. Among the Somalis it is known as " habbak dunkal " and is stated to be utilised by them for poisoning leopards. These animals are said to be the worst enemy of the goat in the colony, and goats are largely kept by the inhabitants (" British Somaliland," R. E. Drake-Brockman). The method of employing the gum-resin is to smear it on a dead goat or other animal which is used as a bait. According to Drake-Brockman the substance is also used medicinally to a certain extent by the Somalis in the treatment of boils and abscesses. A good sample of " habbak dunkal " was recently received at Kew from Mr. Alex. Curle, who is engaged in survey work in the colony. This sample consists for the most part of globular pieces varying in colour with a hard roughened and somewhat cracked exterior. On being fractured the yellow or yellowish-red interior is opaque and dull in appearance. It is bitter to the taste and on being moistened becomes sticky and milky white in colour.

Commiphora Drake-Brockmanii is known to occur in the maritime hills south-east of Berbera and on dry rocky hillsides at Karin (alt. 1100 ft.) where it is common (Collenette). The tree is stated to possess a somewhat gnarled appearance, seldom exceeding 3–4 ft. in height, and to be scantily covered with leaves. Apparently flowers may appear either before or simultaneously with the leaves.

F. N. H.

Shrubs and Trees for the Garden.*—In this book the author makes no attempt to give highly technical descriptions of the shrubs and trees hardy in our gardens, neither has his object been to supply additional knowledge to those people who already know a good deal about the subject. His aim has been to produce a book that will be useful to people who know little about the subject but are fond of trees and want advice upon the many necessary cultural details in clear and concise form, and help in the selection of suitable subjects for different purposes and conditions. The need for such a book is very evident from the number of people who seek advice upon these questions, and that the author has succeeded in his object there can be no gainsaying, for the book is a mine of information concerning trees and shrubs and their requirements. It consists of 35 chapters, 33 of which deal with various phases of cultivation under special headings, such as: trees and shrubs for hedges, catkin-bearing trees and shrubs, trees and shrubs for wind-swept and seaside gardens, berried and fruiting trees and shrubs, climbing shrubs, the heath garden, planting and transplanting, pruning, tree surgery, Japanese dwarf trees, propagation, etc. When necessary, descriptive lists of suitable plants are included in the chapters. There is then a long glossary in alphabetical order describing the necessary technical terms used. Chapter 35, which runs from page 237 to page 566, passes in review a very large number of trees and shrubs, giving useful information about each one. The book is well illustrated, and author and publishers are to be congratulated upon producing a most useful and easily understood book at the modest price of one guinea.

W. D.

I. B. Pole Evans.—In K.B. 1933, 304, line 8, "Doctor of Science" should read "Doctor of Laws."

---

*By A. Osborn. Ward, Lock & Co., Limited, London and Melbourne, 1933. Pp. 576, illustrations 72, 8 coloured. Price 21*s*. net.

Printed under the authority of His Majesty's Stationery Office,
By the South Essex Recorders, Ltd., High Road, Ilford.

(803) Wt. 92/33 925 12/33 S.E.R. Ltd. Gp. 9.

ROYAL BOTANIC GARDENS, KEW

BULLETIN OF MISCELLANEOUS INFORMATION

APPENDIX, 1933.

REVIEW OF THE WORK OF THE ROYAL BOTANIC GARDENS, KEW, DURING 1933.

LONDON
PUBLISHED BY HIS MAJESTY'S STATIONERY OFFICE
To be purchased directly from H.M. STATIONERY OFFICE at the following addresses
Adastral House, Kingsway, London, W.C.2; 120, George Street, Edinburgh 2
York Street, Manchester 1; 1, St. Andrew's Crescent, Cardiff
80, Chichester Street, Belfast
or through any Bookseller
1934
Price 1*s.* 4*d.* net.

70-52-2-33

ROYAL BOTANIC GARDENS, KEW.

LIST OF STAFF.

31st December, 1933.

Head Office.

Director—Sir A. W. Hill, K.C.M.G., M.A., Sc.D., D.Sc. (Adelaide), F.R.S., F.L.S., F.N.Z.Inst.

Assistant Director—J. S. L. Gilmour, M.A., F.L.S.

Economic Botanist—H. C. Sampson, C.I.E., B.Sc., F.L.S.

Assistant Botanist—B. L. Burtt.

Clerk (Higher Grade)—S. F. Ormsby.

Herbarium and Library.

Keeper—A. D. Cotton, F.L.S.

Deputy Keeper—T. A. Sprague, D.Sc., F.L.S.

Botanists—Miss E. M. Wakefield, M.A., F.L.S.
W. B. Turrill, D.Sc., F.L.S.
J. Hutchinson, F.L.S.
C. V. B. Marquand, M.A., F.L.S.
V. S. Summerhayes, B.Sc.
Miss M. L. Green, B.A., F.L.S.
F. Ballard, B.Sc.
N. Y. Sandwith, M.A.
C. E. C. Fischer (*India*).
R. A. Dyer, M.Sc. (*South Africa*).

Temporary Botanists—C. E. Hubbard.
E. W. B. Milne-Redhead, M.A.

Assistant Botanist—E. Nelmes.

Temporary Assistant Botanists—A. R. Horwood.
H. K. Airy-Shaw, B.A.
A. A. Bullock, B.Sc.
Miss C. I. Dickinson, B.A.

Artist—G. Atkinson.

Hon. Associate (*Transplant and Breeding Experiments*)—E. M. Marsden-Jones, F.L.S.

Jodrell Laboratory.

Assistant Keeper—C. R. Metcalfe, M.A., Ph.D.

Museums.

Keeper—W. Dallimore, V.M.H.

Assistants—J. H. Holland, F.L.S.
F. N. Howes, M.Sc.

Gardens.

Curator—J. Coutts, V.M.H.

Assistant Curators—A. Osborn (*Arboretum*).
C. P. Raffill (*Temperate*).
L. Stenning (*Tropical*).
G. W. Robinson (*Herbaceous*).
A. S. Wilson (*Greenhouse and Ornamental*).

Clerk (Higher Grade)—R. F. Williams.

BULLETIN OF MISCELLANEOUS INFORMATION Appendix 1933
ROYAL BOTANIC GARDENS, KEW

REVIEW OF THE WORK OF THE ROYAL BOTANIC GARDENS, KEW, DURING 1933.

General.

STAFF.—Mr. W. N. WINN retired under the age-limit from the post of Botanist (previously Assistant) in the Curator's Office on June 19th, after over 43 years' service at Kew (see K.B. 1932, 408, where the date June 15th is given in error). Mr. R. F. WILLIAMS has been appointed Higher Grade Clerk in succession to Mr. Winn.

Mr. S. A. SKAN retired from the post of Botanist in the Herbarium on September 30th, 1933 (K.B. 1933, 462). Mr. Skan had discharged the duties of Librarian for many years; the general supervision of the Library has now been undertaken by Dr. T. A. SPRAGUE, Deputy Keeper of the Herbarium and Library, with Mr. E. NELMES, Assistant Botanist, as his assistant.

Mr. N. Y. SANDWITH, Temporary Botanist, has been appointed Botanist in the place of Mr. Skan.

DR. O. STAPF.—Kew has suffered a great loss by the death on August 4th of Dr. O. Stapf, F.R.S. (K.B. 1933, 369). Since his retirement from the Keepership of the Herbarium in 1922, Dr. Stapf had worked continuously at Kew in his capacity as Editor of the "Botanical Magazine" and Hon. Editor of the "Index Londinensis" on behalf of the Royal Horticultural Society. The Director has been appointed Editor of the "Botanical Magazine" in succession to Dr. Stapf and work on the supplement to the "Index Londinensis" is being carried on under the direction of Mr. W. C. Worsdell.

OFFICIAL VISITS.—MR. R. A. DYER, Assistant for South Africa, spent four weeks on the Continent during September. He visited Botanical Institutions at Paris, Geneva, Vienna, Zurich, Berlin, Stockholm and Uppsala. The tour was made at the request of the South African Government and was financed partly by them and partly by Kew. Mr. Dyer was able to accomplish much useful work, both on behalf of the herbaria in South Africa and in connexion with investigations being carried on at Kew. Special opportunity was taken of exchanging views with the many botanists whom he met during his tour and by whom he was received with uniform kindness and hospitality.

COLLECTING EXPEDITIONS.—Mr. J. B. GILLETT returned to England early in April having completed his work on the British Somaliland-Ethiopia Boundary Commission, the commencement of which was described in last year's "Annual Review" (p. 4). Early in 1933 Mr. Gillett visited the dry districts east of Berbera, where, owing to unusually good winter rains, the subdesert flora was seen under very favourable conditions. These winter rains in the coastal districts are not recorded in official meteorological reports, but they appear to be a regular and important climatic feature. In order to study their effect further, Mr. Gillett revisited the plateau north of Buramo at the beginning of February.

On February 12th, Mr. Gillett left British Somaliland for Harar in the botanically little known country in the east of Abyssinia. Here he spent a month collecting in the mountain districts to the east and west of the town. Mr. Gillett returned to England at the beginning of April, having spent three days collecting at Aden *en route*.

He collected in all 1621 numbers, in addition to living roots, bulbs and seeds of the more interesting or showy plants. He also paid special attention to the ecology of the region and to the economic properties of the indigenous flora. He has made several constructive suggestions on such subjects as overgrazing, plant introduction and the improvement of existing crops, and these have been incorporated in a full report presented to the Colonial Office. An account of his ecological work and an enumeration of his collections will appear in due course.

During his stay in Africa Mr. Gillett received every possible assistance from Colonel E. H. M. Clifford, Senior British Commissioner, from other officers of the Boundary Commission, and from the District Officer in the areas visited. At Harar, through the kindness of H.M. Consul, Captain Long, he was able to make the British Consulate his base for expeditions into the neighbouring mountains.

When Mr. Gillett left the Commission, Colonel Clifford arranged for Major H. C. Godding to continue making botanical collections on behalf of Kew, and a consignment of plants has already been received from him.

Mr. W. G. EGGELING, Assistant Conservator of Forests, Uganda, has sent home two valuable collections of dried plants, one from Mt. Mfumbiro in the Virunga volcanic region, and the other from Mt. Ruwenzori. These expeditions were undertaken with the aid of the Empire Marketing Board grant to Kew for overseas missions and collecting purposes.

BANANA RESEARCH.—The collection and propagation of banana types for ultimate despatch, after quarantine, to the Imperial College of Tropical Agriculture at Trinidad has been continued. The majority of those obtained from the Malayan region have been despatched and fresh collections from the east and west coasts of peninsular India are now being established. Thanks are due to the Directors of Agriculture in Madras and Bombay for their ready co-operation in this work. In addition to the regular work of this quarantine house, it has been found possible to propagate suckers of three varieties of *Musa textilis* obtained from Malaya and intended for the Department of Agriculture in Uganda. This important service was considered necessary owing to the danger of introducing disease, which might have disastrous consequences in those parts of East Africa where the fruits of edible species of *Musa* enter so largely into the diet of the native races.

SORGHUMS.—With the collaboration of the Directors of Agriculture in those parts of the empire where Sorghum is indigenous, very large collections of herbarium specimens of varieties and types of this important cereal crop have been brought together in the herbarium. Accompanying these specimens there is a mass of cultural data, and Mr. J. D. Snowden, lately Botanist in the Agricultural Department in Uganda, is now making a critical examination of this material, thanks to the help of the Bentham-Moxon Trustees, with a view to preparing a memoir on this crop.

COWPEAS (*Vigna unguiculata* (L.) Walp.).—Work on somewhat similar lines to that on Sorghums has been commenced with this important pulse crop. A questionnaire on the subject has been circulated and many Directors of Agriculture are making arrangements to collect and grow local varieties so that definite herbarium material and cultural information can be obtained. The ready co-operation of Agricultural Departments in this work, which entails considerable labour in addition to their normal duties, is very gratifying and shows that the value of such crop studies is appreciated by the departments concerned.

PLANT AND SEED INTRODUCTION.—With a view to gaining accurate knowledge regarding the cultivated crop plants of the Empire, information regarding their occurrence has been collected through the various Agricultural Departments by means of a questionnaire. This information has now been indexed with a view to publication. Such a publication should prove of great value to the agricultural development of the countries concerned by indicating where seeds and plants of particular species required in connexion with crop improvement can be obtained.

TUNG OIL.

Aleurites Fordii.—It is now definitely established that this species will not thrive in the moist tropics, though where there are definite dry seasons and the elevation is sufficiently great to alleviate the temperature the possibilities of this becoming a crop of economic importance are still being studied.

Aleurites montana.—A further supply of seed of this species, obtained from China, has been distributed. Reports on the growth of *A. montana* are now being received and it is satisfactory to note that the likelihood of its suitability for cultivation in more tropical countries is being substantiated.

DIRECTOR'S OFFICE.—The reorganisation of the Registry, recorded in the last "Annual Review" (p. 6), is now complete and the benefit of a really efficient system under a Registry Clerk is being felt by all departments of the establishment.

PUBLICATIONS.—Ten numbers of the "Kew Bulletin" were published during the year, the present "Review" forming an appendix and completing the volume for 1933. The "List of Seeds" was published as a separate pamphlet in December.

The new editions of the handlists of "Trees and Shrubs" and "Rock Garden Plants" are still in the course of preparation. The former will appear early in 1934 and the latter shortly afterwards.

Section 2 of volume 5 of the "Flora Capensis" was published on March 25th, thus completing the work as originally planned (K.B. 1933, 367). Part 6 of volume 9 of the "Flora of Tropical Africa," completing the account of the subfamily *Panicoideae*, was published on Jan. 1st, 1934.

The Gardens.

VISITORS.—The number of visitors to the Gardens in 1933 was 1,226,057—weekdays (not students' days) 619,778; students' days 110,107; Sundays 496,172—an increase of 157,662 as compared with the figures for 1932.

The greatest monthly attendance was in April with 253,826 and the lowest in December with 7090. The highest daily attendance was 69,409 on Whit-Monday, June 5th; the lowest was 17 on January 13th.

GENERAL.—The summer of 1933 was characterised by prolonged spells of hot and dry weather, which entailed much extra labour and expense in watering. During the year 45,000,000 gallons of water were used, the peak consumption being 2,656,000 gallons for the week ending August 14th; the consumption was 2,481,000 and 2,189,000 gallons respectively during the weeks ending September 4th and 11th. Plants in the Gardens do not appear on the whole to have suffered any material injury, the supply of water being sufficient to meet the requirements created by the conditions of drought. It is possible, however, that the unusual dryness may yet show ill effects among some of the older trees, particularly beeches. One result of the hot summer was the ripening of fruits which seldom mature at Kew, viz.—*Sophora japonica*, *Catalpa bignonioides*, *Liriodendron Tulipifera*, *Aesculus parviflora*, *Asimina triloba*, *Parrotia persica*, *Corylus mandshurica*, *Diospyros virginiana* and *D. kaki*.

BEATING THE BOUNDS.—On Wednesday, May 24th, the ancient ceremony of "Beating the Bounds" of Kew Parish was revived.

Part of the boundary crosses the Gardens and the Director accompanied the party for a portion of their course.

DECORATIVE DEPARTMENT.—Following the removal of the clipped yews on the south side of the Palm House, the gravel paths which they bordered have been broken up and turfed down, thereby adding considerably to the restfulness of the scene.

In the Melon Yard, House no. 22 has been re-roofed and partly reconditioned.

A shelter made of western red cedar (*Thuja plicata*) has been erected in Cambridge Cottage Garden, through the kindness of Messrs. Gabriel, Wade and English, Ltd. (see Kew Bull. 1933, 254).

ROCK GARDEN.—Several sections in the Rock Garden have been reconstructed, the opportunity being taken to provide fresh compost and to afford deeper root runs. A section has been cleared specially and prepared for the accommodation of the Sedum collection. This new grouping should make the work of comparison and identification easier in the future.

TEMPERATE HOUSE.—The work of replacing the old saddle boilers has been continued, six new sectional type units having been installed. The iron ventilators on the side of the south wing have been replaced by others made of teak, whilst the floor of the gallery is at present undergoing repair. Two bins for the reception of ashes from the stokeholds have been constructed and as they are recessed into the terrace they should do away with what, for many years, has been an unsightly feature.

New and rare plants which flowered during the year were *Vallea stipularis*, a rare Tilaceous tree ; *Rhododendron Parryae*, a new May-flowering species from Burma, raised from seed received from Mrs. A. D. Parry, Lushai Hills, Assam, in 1929; and *Camellia saluenensis*, a new species from China, received as *Camellia speciosa* from Mr. J. C. Williams, Caerhays Castle, Cornwall.

ARBORETUM.—The alterations to the shrubbery leading from House no. 1 to the Palace, which were commenced last year, have been completed and add considerably to the amenities of that section of the Gardens.

It has been felt for some time that the network of cross paths separated by patches of tall Rhododendrons and Berberis at the north end of the lake was unsatisfactory, but it was not until the present winter that sanction could be obtained for a special grant to employ 12 extra labourers to help in effecting an improvement. By the end of the year the redundant paths had been eliminated and much of the undergrowth had been cleared away, thus opening up new and unexpected vistas over green slopes down to the edge of the lake.

By the aid of the same grant the construction of a road round the depot in the Palace Nursery and other work has been put in hand.

The bright red brick piers of the gateways leading into Cambridge Cottage Garden, erected in 1906, when the area was presented to Kew by H.M. King Edward VII, have been rebuilt with old bricks and now harmonise with the old wall of the Garden. Further, the western gateway, which previously afforded a view only of the herbaceous border, has been moved a few yards to the East, thus rendering visible from the outside considerably more of the garden, including the new western red cedar shelter. This improvement has necessitated the alteration of the line of the path leading towards the "T" Range, which now runs in a long "S" curve from the gateway to Cumberland Mound.

TROPICAL DEPARTMENT.—Palm House. Repairs have been carried out to the ironwork; that on the exterior of the structure has been repainted. A section of the central hotwater pipes has been overhauled and fitted with new valves. The steps leading down to the pond in front of the house have been lifted and reset.

"T" Range.—Hotwater pipes in the Orchid Show Houses have been re-levelled and new valves fitted.

In House no. 9 the 10-inch hotwater main has been renewed and placed under the pathway where it will be accessible for examination and repair.

Ferneries.—Except for the central wing, House no. 2 has been thoroughly overhauled and the interior and exterior have been repainted. The hotwater pipes in the Fernery Pits have been overhauled and new valves installed.

New hotwater mains have been laid into House no. 5 and the centre bed at the south end has been rearranged so as to allow a bed to be made up and planted with a collection of Proteaceous plants presented by the Hon. Mrs. E. Ryder (see p. 14).

In the Office Yard a new sectional boiler has been installed in place of two of the old saddle type.

Amongst the plants which have attracted special interest in this department during the year may be mentioned *Nymphaea micrantha*, which produces young plants adventitiously on its leaves, *Victoria regia*, which was exceptionally fine and remained in good condition for much longer than usual, and the pitcher plants (*Nepenthes*).

RAINFALL RECORD.

Rainfall recorded at the Royal Botanic Gardens, Kew, during 1933:

	Inches.		Inches.
January	1·51	July	2·08
February	2·65	August	0·61
March	2·20	September	2·38
April	0·69	October	1·26
May	1·71	November	1·04
June	2·10	December	0·31

Total 18·54 inches.

The total for 1932 was 21·84 inches.

EXHIBITION OF S. AFRICAN WILD FLOWERS AT VINCENT SQUARE. —In October an interesting exhibition of S. African wild flowers was staged at Vincent Square under the auspices of the Royal Horticultural Society. Many of the plants were subsequently presented to Kew by the S. African authorities responsible for the exhibition. Among the most valuable of the acquisitions are a collection of *Aloe* species from Mr. A. W. van den Houten, a series of small pans of succulents, some of them exceedingly rare species, from Dr. J. Luckhoff, a collection of *Proteaceae* grown by the Hon. Mrs. E. Ryder at Durns, on the Solent, and a selection of cut flowers for incorporation in the herbarium.

TROPICAL FISH.—In January Mr. A. E. Hodge, Editor of "The Aquarist & Pondkeeper," suggested that angel fish might be introduced into the *Victoria regia* tank in House no. 10, and kindly offered to arrange for the supply of suitable stock. Following on his suggestion a number of fish was presented by Messrs. Cura & Sons, and the Derham Fish Farm, Ltd. These have bred successfully and there are now nearly sixty young ones.

In addition eight Japanese telescopic-eyed moors were presented by the Rev. Bertram Stower, and it is hoped that they also will become successfully established.

WATERFOWL.—The principal additions during the past year have been a pair of black-necked swans generously presented by Mr. Alfred Ezra, F.Z.S., of Foxwarren Park, Byfleet, who also presented a pair of carolina ducks; a pair of bernicle geese received from St. James's Park in exchange; a pair of muscovy ducks presented by Mr. J. S. Romer; and a pair of falcated teal, a shoveller duck, two pairs of garganey and two pairs of common teal, all received by way of exchange. One of the storks strayed away for some time during the summer and was eventually recaptured on the Mid-Surrey Golf Course, and restored to its mate in the Gardens.

STUDENT GARDENERS.—Although the general depression continues to affect the outflow and inflow of students the position as a whole in regard to the year now under review is satisfactory and shows a slight improvement upon 1932.

Outgoing Students.—Seventeen men completed their training and secured appointments as follows :—

Home.—Botanic Garden, Cambridge—one ; Parks Departments—eight ; Reading University (with scholarship) one ; Nurseries—two.

Overseas.—Chile (Tierra del Fuego)—one ; Italy (including an Italian who returned to La Mortola)—two ; New Zealand (Dunedin Botanic Garden)—one ; Spain—one.

One other, who was due to return to Kew from La Mortola, secured an interesting position on the Riviera, whilst three men, by exchange arrangements, proceeded to Berlin Botanic Garden, La Mortola and France respectively.

New Entrants.—Seventeen men—all British subjects—were appointed to the full-course vacancies and were recruited as follows :—

Parks Departments—six ; Botanic Garden, Cambridge—one ; St. John's College Garden, Cambridge—one ; nurseries or private gardens—nine, of whom one returned from the U.S.A., whilst another came from New Zealand.

In addition, under the exchange arrangements referred to above, one man came from Berlin and another—the son of a former Kew student now a nursery proprietor—from Louveciennes, France.

Apart from the above changes four young Dutch students were admitted for short courses of instruction varying in duration according to individual requirements. Two of them returned to Holland before the end of the year ; two will complete their studies in the early part of 1934.

CONTRIBUTIONS TO THE GARDENS, 1933.—During the year, 1107 separate consignments of living plants, seeds, etc., were received and added to the collections. The record set up in 1932 is thus broken by an increase of 53. The following were the more important donations :—

Public Institutions :—

Amani, East African Agricultural Research Station.—A varied collection of plants, tubers, bulbs and seeds.

Arnold Arboretum, U.S.A.—Seeds, including *Gentiana crinita* and *Cladrastis platycarpa*.

Auckland, New Zealand Institute of Horticulture.—Kawau orange trees grown on different stocks.

Berkeley, Botanic Garden, University of California.—Large consignments of seeds.

Berlin, Botanic Gardens.—Seeds, various.

Bermuda, Department of Agriculture.—2 cases of bulbs of *Lilium Harrisii*.

British Somaliland-Ethiopia Boundary Commission (through Mr. J. B. Gillett).—Tubers and seeds.

Budapest, Royal Hungarian Horticultural College.—Plants, including *Campanula Kladriana, Statice tatarica* and *Veronica Baumgarteni*.

Calcutta, Royal Botanic Gardens.—Seeds, including *Trapa natans*.

Cambridge Botanic Garden.—Collection of plants, including *Adiantum* spp., and various seeds.

Canberra, Commonwealth Forestry Bureau.—Seeds of *Hibiscus insularis*.

Chelsea Physic Garden.—22 packets of seeds.

Darjeeling, Lloyd Botanic Gardens.—98 packets of seeds.

Dehra Dun, Forest Research Institute.—Seeds of *Saxifraga Stracheyi* and *Lilium giganteum*.

Dublin, Trinity College Botanic Garden.—Seeds of *Quercus glabrescens.*

Dunedin, Botanic Gardens.—Collection of plants and seeds.

Edinburgh, Royal Botanic Garden.—Plants, including *Gesneriaceae,* seedlings and seeds.

Glasnevin, Botanic Gardens.—36 packets of seeds, and plants of *Sarracenia* spp.

Göttingen, Botanic Garden.—54 packets of seeds.

Grahamstown, Albany Museum.—Plants of *Haworthia* and *Mesembryanthemum* spp.

Hatzendorf, Botanic Garden.—Collection of plants and seeds.

Illinois, Morton Arboretum.—22 packets of seeds.

Kirstenbosch, National Botanic Garden.—95 packets of seeds, and rooted cuttings of *Pelargonium* spp.

Lausanne, Botanic Garden.—30 packets of seeds.

London, Empire Marketing Board.—Tulip bulbs from Cyprus.

London, Under Secretary of State, Foreign Office.—Fruits of *Rosa berberifolia* and *R. canina* group collected by Mr. A. C. Trott, British Legation, Tehran.

London, Forestry Commission.—Plant of fastigiate larch, and seeds of *Persea Lingue* and *Laurelia aromatica.*

London, High Commissioner for South Africa.—A large collection of South African plants.

London, Hyde Park.—Collections of plants and consignments of seeds including 184 packets from Nepal.

London, L.C.C. Parks Department.—Collection of greenhouse plants and trees and shrubs.

Lyons, Botanic Garden.—45 packets of seeds.

Montpellier, Botanic Garden.—23 packets of seeds.

Moscow, Botanic Garden.—21 packets of seeds.

New York, Botanic Garden.—Plants, *Hemerocallis* spp., etc., and a collection of seeds including *Monotropa uniflora, Hypopitys* sp. and *Amsonia Ludoviciana.*

Ottawa, Central Experimental Farm.—31 packets of seeds.

Peradeniya, Royal Botanic Gardens.—Collection of palm seeds.

Philadelphia, University of Pennsylvania.—Collection of Sarracenias and Darlingtonias.

Port Elizabeth, Parks & Town Attractions Department.—Plants, cuttings and seeds.

Rome, Botanic Garden.—38 packets of seeds.

Sarajevo, Botanic Gardens.—Seeds of *Sorbus florentina.*

Singapore, Botanic Garden.—Collection of plants including *Scyphostegia borneensis,* also seeds of *Rhododendron retusum* and *Senecio sumatrana.*

Sydney, Botanic Gardens.—Seeds of *Ceratopetalum gummiferum* and *Callistemon* spp.

Taschkent, Botanic Gardens.—28 packets of seeds, also a collection of bulbs of *Tulipa* spp.

Trinidad, Department of Agriculture.—Collection of plants and seeds, and pods of cacao.

Vancouver, University of British Columbia.—21 packets of seeds.

Washington, U.S. Department of Agriculture.—A varied collection of seeds, including spp. of *Quercus*.

Wellington, State Forest Service.—Seeds, including 4 spp. of *Nothofagus*.

Wisley, Royal Horticultural Society's Gardens.—Plants, including spp. of *Berberis*, and various seeds.

Private Donors :—

Mrs. N. Anderson, Southport.—A large collection of filmy ferns.

Messrs. Armstrong & Brown, Tunbridge Wells.—Plants of *Coelogyne burfordense* and *Cyrtopodium Andersonii*.

Mr. S. C. Atchley, Athens.—Bulbs of *Muscari* sp. and seeds of *Lilium Heldreichii*.

Mr. F. R. S. Balfour, Dawyck, Scotland.—Plants, including *Waldsteinia fragarioides* and *Lomaria alpina*.

Miss Winsome Barker, Bolus Herbarium, Kirstenbosch.—Plants, bulbs and seeds.

Lady Muriel Jex-Blake, Nairobi.—Seeds and cuttings of *Edithcolea grandis*.

Mr. A. C. Bourne, North Vancouver, British Columbia.—Plant and seeds of *Linnaea canadensis*, and seeds of *Hypericum anagalloides*.

Mr. J. R. Brown, California.—Plants of *Haworthia turgida* and *Apicra pentagona*.

Mr. T. R. Brown, Bombay Presidency.—Tubers of *Amorphophallus* sp.

Mr. H. Bruins-Lich, Trinidad.—Seeds and bulbs.

Mr. E. G. Bryant, Prieska, South Africa.—Collection of plants.

Col. Stephenson R. Clarke, Cuckfield.—Plants, including *Styrax dasyanthus*, *S. japonicus*, *Rhododendron Haemonium* and *Quercus Ludoviciana*.

Rt. Hon. Sir George R. Clerk, Angora.—Seeds of *Rosa foetida*.

Sir Jeremiah Colman, Bt., Gatton Park.—Orchids.

H.R.H. The Duke of Connaught, Bagshot Park.—Cuttings of *Wistaria multijuga*.

Capt. H. J. Dunne Cooke, London.—Plants and cuttings of Mesembryanthemums.

Mr. W. A. Constable, Tunbridge Wells.—Bulbs and seeds of *Lilium* spp.

Mr. G. H. Dalrymple, Bartley.—Plants of hybrid *Lobelia* and *Cytisus*, also cuttings of *Picea glauca* var. *echiniformis*.

Mr. L. Denny, Strawberry Hill, Middlesex.—10 succulent plants.

Messrs. Clarence Elliott Ltd., Stevenage.—Plants of *Calceolaria tenella* and seeds of *Paeonia Mlokosewitchii*.

Mr. L. M. Ellis, Sydney.—Seeds of a wild *Musa* from North Queensland.

Lt. Col. H. C. Elwes, Cheltenham.—Plant of *Trichodesma Boisseri.*

Dr. P. L. Giuseppi, Felixstowe.—Plants and seeds.

Mr. P. J. Greenway, Tanganyika Territory.—A collection of seeds, also tubers of an edible Labiate.

Major C. E. Gresham, Cairo.—9 packets of seeds collected on Mt. Troodos, Cyprus.

Mr. S. H. Griffin, Farnham.—Collection of succulents.

Mr. E. R. Guest, Wimbledon.—Seeds, rhizomes and bulbs collected in Iraq.

Mr. A. Haggard, Ledbury.—Collection of orchids from Sao Paulo, Brazil.

Mr. Cecil Hanbury, La Mortola.—A large collection of seeds, also a consignment of bulbs of *Lilium candidum.*

Mr. F. J. Hanbury, East Grinstead.—Plants of *Lomaria pumila, Draba rupestris* and *Mimulus* species.

Miss T. J. Harris, Sydney.—50 packets of seeds, also a collection of ferns in excellent condition.

Messrs. T. R. Hayes & Sons, Ambleside.—Collection of plants comprising species and varieties of *Erica, Calluna, Helianthemum, Juniperus* and *Pinus.*

Mrs. C. Holmes, Hitchin.—A large collection of Cacti and other succulents.

Admiral A. G. Hotham, London.—Plant of an apricot-coloured *Bougainvillea* from Jamaica.

Mr. A. W. van den Houten, Capetown.—A collection of *Aloë* spp.

Dr. John S. Hudson, London.—Plant of *Tillandsia dianthoides.*

Capt. H. A. Johnstone, London.—Palm seeds, including *Adonidia Merrillii.*

Major L. Johnston, Campden.—Plants, including *Penstemon barbatus* var. *Torreyi* and *Clematis Forrestii.*

Mr. P. N. Kohli, Kashmir.—Bulbs and seeds of *Tulipa* spp.

Mr. C. H. Lankester, Costa Rica.—Plants, principally orchids, and miscellaneous seeds.

Mr. H. Q. Levy, Jamaica.—A collection of orchids.

Dr. J. Luckhoff, Cape Town.—A valuable collection of *Mesembryanthemum* spp. and other S. African succulents.

Mr. R. H. Macaulay, Argyll.—*Myrtus nummularia, Hydrangea hortensis* var. *stellata,* and *Cyananthus incanus* var. *leiocalyx.*

The Hon. H. D. McLaren, Bodnant.—Grafts of *Rhododendron spinuliferum* x *R. moupinense,* also a large number of seeds, including a consignment collected in China by Forrest's native collectors.

Col. R. Meinertzhagen, London.—Bulbs of *Tulipa* sp., from the top of Mt. Lebanon; 14 packets of seeds from the garden of H.M. The King of Bulgaria, also seeds of *Sonchus palustris.*

Mr. F. W. Millard, East Grinstead.—Plants of *Pernettya tasmanica.*

Mr. H. Armytage Moore, Co. Down.—Rhododendrons, and seeds of *Ranunculus Lyallii* and *Meconopsis superba.*

Mr. C. T. Musgrave, Hascombe.—Plants and seeds.

Messrs. W. T. & H. E. Neale, Newhaven.—Collection of Cacti.

Mr. J. Nitzan, Palestine.—5 succulent plants, including one exceedingly good specimen of *Echinopsis gemmatus*; bulbs of *Pancratium maritimum* and seeds of *Agave sisalana*.

Mr. Kennedy North, London.—A collection of succulents, and 8 packets of seeds.

Major A. Pam, Broxbourne.—Valuable collection of bulbs, including *Fritillaria libanotica*, corms and tubers, and seeds of *Ferraria undulata*.

Major P. Peckell, Odiham.—Orchids.

Mr. D. Pringle, Port Elizabeth, South Africa.—Stapeliads

Dr. R. H. Pulleine, South Australia.—Cuttings of 5 species of *Euphorbia* and 48 packets of seeds, including *Carpobrotus aequilateralis*.

Sir John Ramsden, Bt., Gerrards Cross.—Plants of *Rhododendron* spp.

Lady D. Rendlesham, Falmouth.—*Echinops* sp., *Aloe*, etc.

Mr. G. A. Rock, Kingston, Jamaica.—*Ionopsis utricularioides*, *Broughtonia sanguinea* and spp. of *Oncidium*.

Mr. C. Gilbert Rogers, Nairobi.—Seeds of *Delphinium*, *Protea*, *Lobelia* and *Hypericum* spp., etc.

Major Lionel de Rothschild, Exbury.—*Callicarpa rubella* and a collection of *Pernettyas*.

Hon. Mrs. E. Ryder, Beaulieu.—Plants, including a collection of Proteas and Leucadendrons, and miscellaneous seeds.

Mrs. W. H. St. Quintin, Malton.—A collection of plants of *Orchis* and *Serapias* spp.

Mr. W. A. Schipp, British Honduras.—Two large consignments of plants, also seeds.

Mr. F. W. Schumacher, Jamaica Plain.—Seeds of *Rhododendron* species and varieties.

Mr. A. E. Seaward, Romford.—Hybrid *Cattleyas*.

Mr. H. B. Sharpe, Kenya.—Seeds collected in the Tana River district.

Mr. C. J. Sibbett, Cape Town.—10 packets of seeds.

Mr. B. W. Slavin, City of Rochester, U.S.A.—A particularly interesting collection of conifers and shrubs, including *Picea Abies* var. *Maxwellii* (true) also varieties of *Pinus* new to British Gardens.

Major A. A. Dorrien Smith, Tresco Abbey.—Plants and seeds.

Prof. N. J. G. Smith, Grahamstown.—18 succulent plants, and seeds of *Welwitschia mirabilis*.

Mr. J. E. Spingarn, New York.—Seeds of *Clematis* spp.

Miss D. B. Stafford, Enfield.—Bulbs and plants from Peru.

Lady Beatrix Stanley, Madras.—Seeds of *Klugia notoniana* and *Didymocarpus tomentosus*.

Miss E. Stephens, Cape Town.—*Utricularia capensis*, sent in original soil from Table Mountain.

Mr. J. E. H. Stooke, Hereford.—*Lilium* seeds and seedlings.

H.R.H. The Crown Prince of Sweden.—Plants of *Cassiope hypnoides* and *Linnaea borealis*.

Mr. W. G. Theobald, Steyning.—Succulents.

Mr. J. N. Thorncroft, Barberton, Transvaal.—A collection of seeds.

Dr. A. M. Vollmer, San Francisco.—Bulbs and seeds of *Lilium* spp.

Mr. John Vorres, Athens.—Seeds, including *Chimonanthus fragrans*.

Dr. A. Wade, London.—Palm seeds from the Great Valley of Madagascar.

Mr. F. A. Weinthal, New South Wales.—A collection of orchids and 4 packets of miscellaneous seeds.

The Allan C. White & Boyde L. Sloane Stapelia Collection, California.—Collection comprising 50 Stapeliads.

Messrs. K. Yashiroda Ltd., Japan.—Seeds from Formosan Expedition and plants of *Rhododendron chrysanthum*.

Mr. R. G. N. Young, S. Rhodesia.—17 packets of bulbs and seeds collected in north-eastern Angola and Belgian Congo.

DISTRIBUTION OF PLANTS AND SEEDS.—The usual distribution of seeds was made in the early part of the year and comprised 172 consignments, made up of 5900 packets of herbaceous plants and 4244 packets of trees and shrubs, an aggregate increase of 353 packets over the previous year's totals.

Seeds of subjects of particular interest specially distributed were *Gentiana crinata*, *Pernettya* sp. from Hobart, *Aesculus indica*, *Aesculus californica*, and *Rosa persica* (synonymous with *Rosa berberifolia*), whilst economic subjects procured for distribution within the Empire included species and varieties of *Pyrethrum*, *Cyphomandra*, *Chenopodium*, *Sorghum*, *Artemisia*, *Musa*, *Astragalus*, *Stylosanthes*, *Caesalpinia*, *Alysicarpus*, *Cenchrus*, *Digitaria*, *Trifolium*, millet, oats, rye, chillies, cucumber, onion, sisal and tung oil.

Overseas shipments of plants, for which Wardian cases were used in some instances, were despatched to Government House, Madras; Hobart, Tasmania; Department of Agriculture, Madras; Penang; Queens Park, Western Australia; Botanic Gardens, Dunedin; Botanic Gardens, Peradeniya and Cape Town. In addition, consignments of banana suckers raised at Kew from material collected in various parts of the world were sent to Trinidad (see p. 4); offsets of *Agave* species received from La Mortola were sent to Tanganyika; orchids from Trinidad were reshipped to India; Wardian cases of cacao seedlings from Trinidad and pineapple slips from Porto Rico were forwarded to Nigeria. Further distributions of plants raised at Kew of the seedless variety of pomegranate, referred to in the "Review" for 1932, were made to British dominions.

Other recipients of plants, etc., from Kew included the following:—

Aberystwyth, Imperial Bureau of Plant Genetics.—Seeds of *Trigonella Foenum-graecum.*

Aberystwyth, Welsh Plant Breeding Station.—Plants of *Cynodon Dactylon, Melinis minutiflora* var. *inermis,* also seeds of *Eleusine indica, Bromus unioloides* and *Bromus marginatus.*

Angora, British Embassy Gardens.—A collection of seeds of herbaceous plants and flowering shrubs.

Baarn, Cantonspark.—Collection of alpine plants.

Bangor, University College of North Wales.—Plants and cuttings of economic subjects.

Belfast, Parks Department.—Seeds of *Victoria regia.*

Berkeley, University of California.—A collection of seeds comprising 21 species and varieties of *Antirrhinum.*

Bermuda, Department of Agriculture.—A collection of bulbs and seeds of *Lilium* species.

Bristol University, Department of Botany.—Seeds of *Clerodendron Thomsonae* and *Cleome spinosa,* also cuttings of 4 species of *Pavetta.*

Brooklyn, Botanic Garden.—Seeds of *Clematis* species.

Brussels, Botanic Gardens.—A collection of plants exhibited by Kew at Ghent Floralies.

Budapest, Royal Hungarian Horticultural College.—Plants of *Caltha, Gymnogramme* and *Dicksonia* spp., also spores of *Dicksonia antarctica.*

Cambridge University Botanic Garden.—Plants, seeds and cuttings.

Coimbatore, Government Sugarcane Expert.—Seeds of *Sorghum* spp., etc.

Copenhagen, Botanic Garden.—Seeds of 12 species of *Acer.*

Cyprus, Department of Agriculture.—Plants of seedless pomegranate, also seeds of *Caesalpinia spinosa.*

Durban, Parks and Gardens Department.—Seeds of *Victoria regia.*

Edinburgh, Royal Botanic Garden.—Plants (including a collection of spp. of *Sarracenia* and *Pinguicula*), seeds and cuttings.

London, Hyde Park.—Seedlings of *Meconopsis grandis.*

Gibraltar, Government House.—Bulbs of *Hippeastrum, Tritonia* and *Zephyranthes.*

Glasgow, Parks Department.—Seedlings of 8 species of *Streptocarpus* and seeds of *Cycas Wadei* and *Coffea stenophylla.*

Glasnevin, Botanic Gardens.—Plants, seeds and cuttings.

Gothenburg, Botanic Garden.—Plants of *Disa tripetaloides* and *Disa Luna.*

John Innes Horticultural Institution, Merton.—Plants, seeds and cuttings.

Kenya, Department of Agriculture.—Plants of scented Pelargoniums for essential oil trials.

Kiel, Botanic Garden.—Plants of *Senecio* (*Kleinia*) *stapeliiformis.*

Kirstenbosch, National Botanic Gardens.—Plants, including seedless pomegranate and *Artemisia Dracunculus,* also seeds of *Cicuta virosa* and *Anethum graveolens.*

Kornik, Poland.—A collection of cuttings comprising species of *Larix, Picea, Taxus, Betula, Carpinus, Celastrus, Cladrastis, Cornus, Maackia* and *Robinia,* also 20 packets of seeds of flowering shrubs.

Leicester, Museum and Art Gallery.—A collection of Cacti and other succulents.

Leningrad, Academy of Agricultural Science.—Seeds of *Melilotus albus, M. indicus* and *M. italicus.*

Lisle, U.S.A., Morton Arboretum.—Acorns of 5 species of *Quercus.*

London, Forestry Commission.—Collection of trees and shrubs, also water lily plants.

London, Passenger Transport Board.—Cuttings of decorative shrubs.

London, Regents Park.—A collection of plants and seedlings of alpine subjects.

Madras, Agri-Horticultural Society.—Seeds of *Nelumbo nucifera.*

Malta, Imperial War Graves Commission.—Seeds of *Arctotis, Ursinia,* and *Dimorphotheca* spp.

Mauritius, Department of Agriculture.—Seed of *Erianthus ravennae*

Montreal, McGill University.—Seeds of species of *Sorghum, Vetiveria, Capillipedium,* and *Chrysopogon.*

Moscow, Institute of Forest Culture and Forest Melioration.—Cuttings of *Populus* and *Salix* species.

Müncheberg, Kaiser Wilhelm Institut für Züchtungsforschung.—A collection of cuttings of *Pelargonium* species.

Nigeria, Assistant Surveyor General.—Seeds and plants of economic subjects.

Oxford, Botanic Garden.—Plants of *Gleichenia* and *Verbena* spp.

Palestine, Director of Agriculture and Forests.—Seeds of *Caesalpinia spinosa* and *Pycnostachys Dawei,* also plants of *Aloë Dawei, Kalanchoë Dawei* and *Clerodendron ugandense.*

Philadelphia, University of Pennsylvania.—A collection of insectivorous plants comprising species of *Drosera, Cephalotus* and *Pinguicula.*

Salford, Parks Department.—Plants and seeds.

Sierra Leone, Department of Agriculture.—*Citrus* grafts.

Swanley, The Horticultural College.—A collection of plants of *Dianthus* species.

Swansea, Parks Department.—Seeds of gourds.

Washington, Department of Agriculture.—Seeds of *Phoenix reclinata, P. farinifera, P. abyssinica* and *P. humilis.*

Wisley, Royal Horticultural Society's Gardens.—Collections of plants, cuttings and seeds.

Wye, South-Eastern Agricultural College.—Plants—mixed herbaceous and a collection of Dahlias, also seeds of *Alstroemeria* and *Jatropha*.

Yochow, Province of Hunan, Agricultural Experimental Station.—Seeds of economic plants.

Sir Francis Dyke Acland, Bt., Broadclyst.—A collection of trees and shrubs.

Mr. B. C. Aston, Wellington, New Zealand.—Seeds of medicinal plants.

Mr. S. C. Atchley, Athens.—Bulbs of *Hyacinthus*, *Narcissus*, *Muscari*, *Cyclamen* and *Tulipa* species.

H.E. Ambassador Assis Brasil, Brazil.—A collection of grafts of pendulous trees and shrubs.

Sir Jeremiah Colman, Bt., Gatton Park.—Plants, including orchids.

Mr. W. A. Constable, Tunbridge Wells.—Seeds of *Lilium* species.

Capt. H. J. Dunne Cooke, London.—Plants of *Mesembryanthemum* species.

Mr. G. H. Dalrymple, Bartley.—Plants and cuttings of dwarf conifers.

Mr. J. Davis, Belmore, N.S.W.—A collection of fern spores.

Messrs. Clarence Elliott Ltd., Stevenage.—Plant of *Centaurium confertum*.

Lt. Col. H. C. Elwes, Cheltenham.—Plant of *Cyrtanthus obliqua*.

Dr. P. L. Giuseppi, Felixstowe.—Plants, including *Oresitrophe rupifraga* and *Celsia bugulifolia*.

Col. C. H. Grey, Cranbrook, Kent.—Plants, including *Pratia angulata*, *P. Treadmanii* and *Claytonia australasica*.

Mr. S. H. Griffin, Farnham.—Collection of Cacti.

Mr. Cecil Hanbury, La Mortola.—Plants, seeds and bulbs.

Mr. F. J. Hanbury, Brockhurst.—Plants, including *Saxifraga stellaris*.

Messrs. Hillier & Sons, Winchester.—Plants, grafts and seeds.

H.M. The King, Windsor Castle.—Plants of *Cornus Kousa* var. *chinensis*.

Knap Hill Nursery Ltd., Woking.—Plants, cuttings and seeds.

Sir Wm. Lawrence, Bt., Dorking.—Plants and seeds of *Victoria regia* var. *Trickeri*.

Mr. H. Q. Levy, Jamaica.—Orchids.

Mr. R. H. Macaulay, Argyll.—Plants, including a collection of Rhododendrons.

Hon. H. D. McLaren, Bodnant.—Plants and seeds.

Mr. F. W. Millard, East Grinstead.—Plants and seeds.

Mr. H. Armytage Moore, Co. Down.—Plants of *Acer*, *Berberis* and *Rhododendron* species.

Mr. C. T. Musgrave, Hascombe.—Plants, cuttings and seeds.

Messrs. W. T. & H. E. Neale, Newhaven.—Collection of Cacti.

Mr. Kennedy North, London.—Plants, including *Gunnera Hamiltonii.*

Major A. Pam, Broxbourne.—Stove plants and shrubs.

Dr. von Poellnitz, Altenburg, Germany.—Collection of succulents.

Major Lionel de Rothschild, Exbury.—Plants and seeds.

Messrs. Rowntree & Co. Ltd., York.—Plants of *Vanilla planifolia* and *Hevea brasiliensis.*

Hon. Mrs. E. Ryder, Beaulieu.—Plants, seeds and bulbs.

Mr. A. E. Seaward, Romford.—Plants of 4 species of *Euphorbia* and *Chamaedorea elatior.*

Mr. F. W. Schumacher, Jamaica Plain.—Seeds of species and varieties of *Rhododendron.*

Mr. C. J. Sibbett, Cape Town.—Seeds of *Lilium regale, Humea elegans,* and *Aesculus californica.*

Mr. Boyd L. Sloane, California.—Plants of *Stapelia, Duvalia* and *Huernia* species.

Messrs. W. C. Slocock Ltd., Woking.—Plants, cuttings and seeds.

Major A. A. Dorrien-Smith, Tresco Abbey.—Plants, including *Manettia inflata,* seedlings and seeds.

Messrs. C. Smith & Son, Guernsey.—Plants of *Camellia* species.

Mr. H. J. Solomon, Sydney, N.S.W.—A small collection of ornamental plants.

Mr. J. E. H. Stooke, Hereford.—Seeds of *Lilium* species also *Nomocharis.*

Mr. W. G. Theobald, Steyning.—Plants of three species of *Cotyledon.*

Dr. A. M. Vollmer, San Francisco.—Seeds of *Lilium* species.

Mr. F. A. Weinthal, New South Wales.—A collection of orchids.

Miss E. Willmott, Great Warley.—Plants of *Bignonia capreolata.*

Messrs. K. Yashiroda Ltd., Japan.—A collection of seeds including *Lilium formosanum* "Price's var."

Bedgebury.

Conditions have, on the whole, been favourable for the development of young trees, though a number of losses have occurred, chiefly through fungus diseases.

The young shoots of a few trees were injured by late spring frosts, but less severely than during the earlier years of the Pinetum. Many of the more vigorous trees are getting above the serious frost line, and smaller subjects are benefiting from the shelter built up by self-sown pine trees, ling and other shelter that has been developed.

Although the year has been abnormally dry nothing suffered from drought and the only plants watered were a few large Rhododendrons that were planted in March. Ground vegetation appeared to have a good effect by shielding the surface roots of the young trees from the bright sun. That the ground dried very considerably is seen from the fact that in late December most of the springs, watercourses, and drains were still dry. The spring from which water is obtained for Park House continued to function throughout the year, but the well on the hill near the pine avenue dried up in summer and was still empty in December. The brook running from the Sequoias to Marshall's lake dried up in summer and was still dry in December, and the other main stream running from the Cupressus to Marshall's lake was so sluggish in December that the surface was covered with thick ice.

Bitterly cold east and north winds accompanied by frost were experienced in early December and shelter had to be built round a number of semi-tender species. Marshall's lake was used by skaters for ten days previous to December 20th, when a thaw occurred. Very variable night temperatures have been recorded from different parts of the Pinetum, the temperature in low, wet places often falling 4–6 degrees lower than at higher elevations a short distance away. On the morning of December 10th 27 degrees of frost were registered on the ground in a low place near Marshall's lake, and on the same morning the minimum screen temperature on higher ground registered only 15 degrees of frost. Abnormally high temperatures were not recorded during summer though the average temperature was higher than usual. Very often higher temperatures were recorded on the lower than the higher ground.

A number of losses have occurred through honey fungus (*Armillaria mellea*), and it appears that such losses may continue, for the old tree stumps left in the ground are very badly infested by the fungus and it easily spreads to living trees. Unfortunately, there does not appear to be any practical means of dealing with this disease. Losses amongst fine-leaved pines have occurred through Weymouth pine rust (*Cronartium ribicola*), and it appears possible that plants already affected by the disease may have been planted.

Insect pests have been less troublesome than usual, though several are still present and a constant watch has to be kept on susceptible plants. Some hand-picking for larvae of pine-shoot Tortrix has been necessary.

Some additional planting was carried out in March, notably a large number of *Rhododendron* spp. from Kew, and a collection of Chinese species generously presented by Sir John Stirling Maxwell, Bt., K.T. A number of conifers required to make up for losses was also planted.

The drought necessitated constant patrol of the ground during week-ends in case of fire, but fortunately the danger period passed without an outbreak. As undergrowth was everywhere very dry general mowing was begun early and completed before the end of November.

Park House was brought under the control of the Forestry Commission during the year and is now occupied by their Forester. A person in authority, who can act in times of emergency, is therefore now living in the Pinetum, which is much better than the previous arrangement. Accommodation is being made in Park House for a small herbarium for the use of students and as a workroom for anyone visiting the Pinetum. The ground round Park House has been added to the Pinetum and will be planted with interesting trees and shrubs. At present it is being worked and cleaned ready for planting.

New work in the Pinetum has hitherto been held up by lack of labour and has only been done by neglecting necessary work in other directions. Temporary fences and bridges are all in need of repair or replacement by more permanent structures. A small increase in the annual grant has now been sanctioned by the Treasury, and it is hoped to carry out some of these improvements during the coming year.

The time has arrived when a good deal of careful pruning is required by large-growing trees, such as *Larix*, *Pseudotsuga*, *Pinus*, etc. When trees are planted wide apart there is a very definite tendency for every branch to develop, and unless this is counteracted, the trees will produce heavy branches from the ground upwards, and height will suffer. The practice to be followed is to clear the lower parts of the trunk to a moderate height at the rate of 9–12 in. a year, at the same time thinning out some of the higher branches where they are growing close together. It is hoped, by careful attention to pruning while the trees are young, to secure a clean, well-developed section of trunk surmounted by a shapely head of branches. A tree of each species with branches easily reached from the ground will be left, in order that the leaf system may be examined by students.

The Museums.

The year has been uneventful so far as the Museums are concerned. Much of the work has been answering the questions of correspondents and visitors, questions that appear to become more numerous and varied year by year. As recorded last year, colonial farmers are very concerned as to suitable crops to add to those they already produce, or to take the place of those that are not a commercial success. Such questions are difficult to answer in these days of over-production, for an additional acreage planted with some hitherto remunerative crop may result in such a serious reduction of price that it cannot be produced at a profit. Some success appears to be following the more extended cultivation of essential oil-yielding plants in East Africa.

The collection of lily bulbs, alluded to in last year's report, was added to and exhibited at the Lily Conference held by the Royal Horticultural Society in July. The preserved bulbs together with a collection of capsules and seeds were afterwards exhibited for some months in Museum no. 4.

Additional specimens of trees and shrubs have been dried, mounted, and added to the arboretum herbarium, and a start has been made in the preparation of an herbarium collection of drug plants.

The greater part of Museum no. 4 (British forestry), with the museum offices, has been redecorated. The skylight in Museum no. 2, which has given trouble for many years, has been rebuilt, and some much-needed repair has been effected to the roof timbers of Museum no. 3. This work entailed a good deal of labour in the removal and rearrangement of specimens.

During the year Mr. J. H. Turner contributed an article to the "Kew Bulletin" on "The Viability of Seeds," in which he described, amongst other instances, how seeds that had been stored in museum jars for periods varying from 43 to 90 years had germinated and produced plants. Mr. F. N. Howes contributed an article on "Variability in Stock-poison Plants."

The Keeper has been President for the year of the Society of Foresters of Great Britain and in that capacity attended the annual meeting of the society in Scotland in May. He also read a paper on "Trees and the Countryside" before the Forestry Subsection of the British Association at Leicester in September. He has continued to act as Executive Officer for the Pinetum at Bedgebury.

Duplicate museum specimens have been distributed to Mr. W. H. Davis, Hockley, Birmingham; Mr. Alan Gardiner, Perce Neige, Chateau D'Oex, Switzerland; Mr. A. L. Hills, Redleaf Estate Office, Penshurst Station, Kent; Mr. E. J. Moore, Birmingham Central Technical College; Mr. F. H. Pierpont, Oakfields, Salfords, Redhill, Surrey; Professor Record, Yale University; Mr. T. Roberts, Bellings, Midhurst, Sussex; M. le Dr. F. Stockmans, Musée Royal d'Histoire Naturelle de Belgique, Bruxelles; Mr. A. L. Thomas, Tonbridge School; Mr. G. Fox Wilson, Department of Entomology, Royal Horticultural Society's Laboratories, Wisley.

PRESENTATIONS TO MUSEUMS.—Australia, Commonwealth of, Australia House, Strand.—Eight planks of Tasmanian timbers.

Mr. E. K. Balls, "Terem," Oakfields, Knebworth, Herts.—Four samples of Turkish hazelnuts.

British Museum, Department of British and Mediaeval Antiquities.—Section of wood enclosing iron chain, said to be part of the Wellington Elm from the field of Waterloo.

Messrs. Chivers & Sons Ltd., Histon, Cambridge.—Twelve bottles of preserved fruits.

Mr. A. T. Curle, 6 Learmouth Road, Edinburgh.—Sample of "dunkal gum" (*Commiphora Drake-Brockmanii*) from British Somaliland.

Mr. John Dean, "Seascape," 572 Head Street, Esquimalt, Victoria, B.C.—Photographs of *Cornus Nuttallii* and *Spiraea discolor*.

Dr. H. E. Durham, Dunelm, Hereford.—Fourteen photographs of mistletoe and its hosts.

Mr. J. E. Edwards, Government House, Gibraltar.—Cone of *Araucaria Cookii.*

Messrs. W. G. Fitzgerald, Ltd., 199 Blackshaw Road, Tooting.—Specimen of zebrano wood.

Dr. Wilfred Fox, Roads Beautifying Association, 7 Buckingham Palace Gardens, S.W. 1.—Two photographs of a large pyramidal tree of *Quercus sessiliflora.*

Dr. H. Frankfurt, 7 Canon Place, Hampstead.—Sample of wood from Palace of Sargon, Assyria, 722–705 B.C.

Messrs. Gabriel, Wade & English Ltd., Wisbech.—Aspen log and veneer.

Mr. E. R. Guest (late Inspecting Officer of Agriculture, Central Experimental Farm, Rustam, Baghdad), Wimbledon.—Seeds of *Lallemantia iberica.*

Mr. J. H. Holland, Museums, Kew.—Thirteen photographs of the Botanic Gardens, Calabar, and two samples of totaquina powder.

Mr. J. E. Hughes, P.O. Box 51, Port Elizabeth, South Africa.—Specimen of wood of *Amblygonocarpus obtusangulus.*

The Director, Imperial Institute, South Kensington.—Sample of fibre of *Agave amaniensis.*

Miss M. H. James, 75 Charlwood Street, S.W. 1.—Sample of hyree leaves (*Albizzia amara*).

Miss M. S. Johnston, 276 Kew Road, Kew.—Corn-cob pipe, ornament made from cactus stem, bowl of juniper wood and various photographs.

Messrs. J. Carter Jonas & Sons, 8 Suffolk Street, Pall Mall East, S.W. 1.—Section of trunk of tree of *Pinus Lambertiana.*

Mr. G. Bowes Loddiges, 6 Baronsmead Road, Barnes.—Collection of about 600 small hand specimens of woods.

Prof. P. E. Newberry, Oldbury Place, Ightham, Kent.—Specimen of barley from King Toser's Pyramid, Saggara, 2980 B.C.

Mr. U. S. Parry, Baghmara.—Wood of *Aquilaria Agallocha.*

Mr. F. H. Pierpont, The Monotype Corporation Ltd., Redhill, Surrey.—Piece of basong root (*Alstonia spathulata*).

Mr. M. E. Weatherall, La Trelade, St. Martins, Guernsey.—Twelve photographs of *Pinus Bungeana.*

Mr. E. J. Wortley, Director of Agriculture, British Guiana.—Samples of nutmegs.

Jodrell Laboratory.

The routine work of the laboratory has as usual been mainly concerned with the identification of miscellaneous botanical material from a study of its anatomy. The chief classes of material dealt with were timbers, barks, fibres, herbaceous stems, leaves, and seeds. Some idea of the very varying nature of the enquiries may be gained when it is mentioned that they included seven samples of variously painted hairbrush-backs, which were found to be made of *Liquidambar styraciflua*; samples of crushed mint leaves which were adulterated with *Ailanthus glandulosa* (tree of heaven); and a compact mass of adventitious roots from Africa (alleged to be used for tanning), which belonged to a species of *Vellozia* (*Amaryllidaceae*). In addition, discussions were held with a Chemist from the Government Laboratory concerning the anatomy of tobacco with a view to the detection of adulterants.

A special investigation on the structure of sandal and other scented woods from various parts of the world has been in progress throughout the year, and it is hoped that an illustrated account of this work will be ready for publication during 1934.

In connexion with the experimental work at Potterne under the direction of Mr. Marsden-Jones and Dr. Turrill, the work on the anatomy of *Centaurea*, mentioned in the report for 1932, has been continued. Unfortunately the results obtained by examining material collected in 1932 and 1933 did not entirely agree. The work, however, is being continued, and it is hoped that an explanation of the discrepancies will be found. Work on the anatomy of the flowers and capitula of *Centaurea* has also been started. An investigation of the embryology of bulbil- and non-bulbil-producing forms of *Ranunculus Ficaria* is in progress in collaboration with Mr. Marsden-Jones.

The number of visitors to the laboratory has been larger than usual, and some have worked for prolonged periods. Special mention may be made of the valuable help given by Mr. E. R. Goodliffe, who carried out a month's intensive work in connexion with the investigation of the anatomy of *Centaurea*, and Mr. B. A. Jay, who assisted by germinating orchid seeds on sterilized culture media, and by making a special study of the structure of some oil-yielding Lauraceous woods from the Federated Malay States. The following is a list of other visitors who worked at the laboratory during the year:—

Miss C. L. Perry. Anatomy of the *Acanthaceae*.
Miss M. R. F. Taylor. Diseases of lilies.
Miss M. E. Lott. Mycology.
Miss M. A. Madge. Fixing cytological material.
Mr. L. A. Boodle. Material excavated from the Egyptian tombs.
Mr. W. R. Philipson. Anatomy of *Agrostis*.
M. Simonet. Fixing cytological material of *Iris*.

Visitors from the John Innes Horticultural Research Station made use of the laboratory on various occasions to fix material for cytological work.

The Herbarium.

The final adjustments and labelling following the opening of the new wing were completed during the year. The most important additional alteration was the re-arrangement of the collection of drawings so as to bring them as near as possible to the specimens.

Owing to the discovery of a fracture in one of the beams in the floor of the Library over the Keeper's room, it was necessary to replace this and another beam with iron girders. Considering the building has been in existence since the middle of the eighteenth century and was only designed as a dwelling-house, it is understandable that the great weight of books should have proved too great a strain for the old flooring. An historical account of the herbarium building will be found in the " Kew Bulletin " for 1891, p. 314.

EUROPE, NORTH AFRICA, AND THE ORIENT.

The year 1933 has been remarkable in this department on account of the number of specimens received for incorporation in the Herbarium. 24,204 numbers (sometimes a single number needing 2 or 3 sheets in mounting) have been presented or purchased. This figure includes 14,363 received for identification or verification, apart from single specimens or small packets sent by correspondents. 11,602 sheets have been mounted and approximately the same number laid in.

Owing to the time involved in identification of new material, very few genera have been newly ' written up ' in the Herbarium, but *Hypericum*, *Marrubium*, and *Clypeola* have been re-arranged and the sheets geographically sorted.

A noteworthy addition to the British collections was the valuable herbarium of Mr. C. E. Britton, presented by him early in the year. This is particularly rich in varieties and forms of British species, and the Exchange Club specimens it contains will fill many gaps. Mr. Britton is continuing to present additional material, much of which he has critically investigated himself. Other contributors of British material include Mr. W. C. Barton, Dr. R. W. Butcher, Miss M. E. Edmonds, Mr. P. M. Hall, Col. H. H. Johnston, Rev. H. J. Riddelsdell, Mrs. C. I. Sandwith, Mr. W. T. Stearn, Mr. H. F. Tresadern, Mrs. M. L. Wedgwood, Miss I. Wright (coll. Rev. Lawson Sant Wright), Mr. H. Stuart Thompson, the Botanical Society and Exchange Club of the British Isles, and members of the Kew staff. In addition special mention should be made of a set of 627 specimens collected between 1890–1900 by the late Mr. A. B. Sampson, presented by his son, Mr. H. C. Sampson; 186 specimens from J. Ralfs' herbarium presented by Mr. H. J. Goddard; 94 sheets of elms from Cornwall collected by Mr. L. T. Medlin and received through Mr. E. Thurston; and a further instalment of over 100 numbers of Alderney plants collected by Messrs. A. Bruce Jackson and H. K. Airy-Shaw.

From the Balkan Peninsula the following important contributions (totalling over 1700 numbers) have been received during 1933: from Greece (Mr. S. C. Atchley), Bosnia, Dalmatia, and S. Croatia (Mr. B. Gilliat-Smith), Bosnia (Dr. K. Maly), Thrace and S. Macedonia (Mr. H. G. Tedd), Bulgaria (Rev. & Mrs. H. P. Thompson, and Mr. B. Stefanoff), Bulgaria and the Dobruja (Dr. T. Wiśniewski).

In addition Mr. A. H. G. Alston (of the British Museum, Natural History) and Mr. N. Y. Sandwith (of Kew) spent some weeks making a botanical exploration of southern Albania. Their beautifully prepared material, consisting of 1040 numbers (not included in the figure at the beginning of this paragraph), has been shared between the British Museum and Kew and will greatly enrich the Herbarium.

Important sets of plants from Scandinavia have been received from Miss I. Wright (coll. Rev. Lawson Sant Wright), Mr. J. W. Wyatt, and the Riksmuseum, Stockholm (*Salix*). Mr. S. C. Atchley has presented 840 sheets of plants collected by him in Portugal and Spain. Mr. J. E. Lousley has given a valuable set of 1549 European plants, mainly collected by well-known botanists in Central Europe. Prof. E. B. Babcock has sent 48 specimens of critically determined species of the genus *Crepis*. Miss I. Wright made a valuable contribution of 513 sheets of plants collected by her father, Mr. Chas. A. Wright, in the Maltese Islands, and also presented a set of specimens collected by the Rev. Lawson Sant Wright in Switzerland. Mrs. J. S. Gamble presented 437 named plants collected by the late Mr. J. S. Gamble in Switzerland. A small collection of Pyrenean plants was received from Col. R. Meinertzhagen.

The following collections have also been received from various parts of Europe :—*Presented* : Czechoslovakia, Flora Exsiccata Reipublicae Bohemicae Slovenicae, cent. viii, by the Masaryk University, Brno ; Hungary, Flora Hungarica Exsiccata, cents. ix and x, by the Hungarian National Museum ; Roumania, Flora Romaniae Exsiccata, cent. xi, by the Cluj University. *Purchased* : Mr. J. Rohlena, Plantae Balcanicae (Montenegrinae) Exsiccatae, series 1 and 2 ; Mr. T. O. Weigel, Tiliae Exsiccatae Criticae, by J. Wagner, fascs. 3 and 4.

From farther east Mr. A. Syngrassides has sent very useful collections from Cyprus ; Mr. E. K. Balls, Dr. W. B. Gourlay, and Miss O. Tufnell from Asia Minor ; Mr. G. W. Furlonge from Arabia ; Mr. E. R. Guest from Iraq ; and Mr. A. C. Trott from Persia. From Egypt large numbers of specimens have been received from the Ministry of Agriculture, Botanical and Plant Breeding Section and the Horticultural Section. Mr. A. W. Trethewy has presented well-dried sets of plants from Morocco and the Canary Islands.

Research and Publications.—Mr. W. R. Philipson, with the aid of a grant from the Department of Scientific and Industrial Research, is engaged in preparing a revision of the British species of *Agrostis*, making an intensive study of both dried material and numerous strains grown in the herbarium experimental ground.

Silene subconica and S. juvenalis (K.B. 1933, 40).

A New Pyrethrum (K.B. 1933, 44).

Variation in Glaucium (K.B. 1933, 174).

Some Notes on the Troodos Pine of Cyprus, by A. Foggie (K.B. 1933, 228).

On the Flora of the Nearer East : XIV (K.B. 1933, 232).

Two Plants New to the Cyprus Flora (K.B. 1933, 407).

The Flora of Leicestershire (Oxford, 1933).

Fritillaria glauco-viridis Turrill (Gard. Chron. ser. 3, **93**, 334 ; 1933).

ASIA.

CHINA, JAPAN AND NORTHERN ASIA.—6000 sheets were mounted during the year and all the outstanding named Chinese specimens, amounting in all to more than 9000 sheets, have been laid in.

Among the collections received during the year, special mention may be made of a set of nearly 800 duplicate specimens of plants collected by the native collectors of the late Mr. George Forrest, presented by the Hon. H. D. McLaren. This collection is being named at the Royal Botanic Garden, Edinburgh, whence a list of determinations will be received later. Another valuable donation consisted of 189 specimens of *Euphorbiaceae* received from Mr. H. C. Sampson. These formed part of the Chinese herbarium of his uncle, the late Mr. Theophilus Sampson, and were probably collected between the years 1880–1889.

The following collections were also received : a duplicate set of named specimens collected by Mr. J. F. Rock, presented by the Arnold Arboretum, Harvard University ; a collection of named specimens collected in Szechuan, Chekiang and Kiangsu, received from the Science Society of China, presented by the Bentham-Moxon Trustees ; a large number of named specimens collected mainly during the third Hainan Expedition, purchased from the Lingnan University, Canton ; a set of named specimens collected by Mr. Y. Tsiang and others in Kweichow and Shangtung, presented by the University of Nanking ; a number of named and unnamed specimens collected by Mr. J. F. Rock and others, given by the United States National Museum, Washington, and a few rare species collected by Mr. E. J. Lipschitz in the Pamirs sent from the Herbarium of the Botanical Institute of the First State University of Moscow.

The gentians collected by Capt. F. Kingdon Ward on the frontier of Burma and Tibet in 1930–31 have been sent on loan to Kew for identification, by the authorities of the British Museum, who also afforded Kew the opportunity of describing new species of *Cyananthus* from Nepal.

A large amount of critical garden material received during the year has been named, and several new species and varieties were described. A considerable number of types have been sent on loan to monographers. The critical identification and checking of the specimens of the *Labiatae* for the proposed " Flora of Fukien " by Dr. F. P. Metcalf was also carried out. Mr. K. Yashiroda's Formosan plants have been named.

Research and Publications.—Gentianaceae collected by J. F. Rock in Western China, etc. (Journ. Arn. Arb. **14**, 28 : 1933).

A new variety of Sorbus Sargentiana (Gard. Chron. ser. 3, **94**, 177 : 1933).

INDO-MALAYA.—Very considerable progress has been made in the mounting and incorporating of the accumulation of specimens from the Malay Archipelago and Philippine Islands, and most of the current collections have been named and incorporated. The main work has consisted in the preparation of the " Flora of the Presidency of Madras," and satisfactory progress has been made, about three-quarters of the *Gramineae*, the last family to be elaborated, having been completed.

The collection of plants made by the Oxford University Expedition to Sarawak in 1932, amounting to about 3400 numbers (including Cryptogams), has now been sorted, and many families have been sent to specialists for critical determination, e.g. *Pteridophyta* and *Orchidaceae* to Singapore, *Musci* to Mr. H. N. Dixon, *Selaginella* to Mr. A. H. G. Alston, whilst several Dutch botanists, both in Holland and at Buitenzorg, have undertaken the naming of certain smaller groups. This important accession to the Herbarium appears to contain a considerable proportion of undescribed species.

Work has been continued on Capt. F. Kingdon Ward's collections from Upper Burma and Assam (1926–28). Special attention has been devoted to the *Ericaceae* (including *Vacciniaceae*), amongst which there have been detected several new species of great interest and taxonomic importance. One of the most outstanding of these is figured in the recently issued part of " Hooker's Icones Plantarum " (vol. 33, pt. 1), and has given rise to more extensive investigations, the results of which it is hoped to publish in the " Kew Bulletin " in 1934. Fresh material of this and other successful introductions of Capt. Ward's, forwarded to Kew by various well-known amateur gardeners in the United Kingdom, has been either preserved in spirit or dried and incorporated in the Herbarium.

Valuable contributions have been received from the Singapore Botanic Gardens and from the Forestry Department of British North Borneo. Lesser collections were presented by Professor E. Barnes, Rao Bahadur K. R. Venkataramana Ayyar and Mr. P. V. Mayuranathan from the Madras Presidency, by the Imperial Forest Botanist at Dehra Dun and Mr. R. N. Parker from North India and Burma, and by Mr. C. McCann from the Bombay Presidency. Professor Barnes' specimens included several new species from the hill areas of S. India.

A large collection made by the Rev. J. S. and Mrs. Clemens in the Kinabalu Range of British North Borneo was purchased. It is believed that Mr. and Mrs. Clemens have succeeded in penetrating to tracts hitherto unexplored botanically, so that it may be anticipated that when the collection has been studied they will add very greatly to the knowledge of the flora of the region.

A number of specimens and seeds of cultivated species and varieties of *Brassica* were received from the Economic Botanist at the Imperial Agricultural Research Institute, Pusa, for critical investigation. The seeds have been sown and the enquiry will be pursued further when the plants have grown sufficiently.

At the close of the year the plants collected during the 1933 Mount Everest Expedition were received. These have not been sorted and classified, but a preliminary investigation showed that they form a valuable contribution towards a knowledge of the flora of this region at very high altitudes.

The following collections were also received :—

INDIA.—*Presented* : Bengal, by the Rev. W. J. L. Wenger ; Burma, by the Forestry Department, Maymyo (grasses) ; Kashmir, by Prof. R. R. Stewart ; Madras, by the Agricultural College and Research Institute, Coimbatore (*Pennisetum* and *Phoenix*).

INDO-CHINA.—*Presented* : Siam, by Mr. H. B. Garrett, Dr. A. F. G. Kerr, and the Botanical Section of the Ministry of Commerce, Bangkok (coll. M. C. Lakshnakara).

Purchased : New York Botanical Garden (coll. R. Squires).

PHILIPPINE ISLANDS.—*Purchased* : Mr. A. D. E. Elmer.

Research and Publications.—Contributions to the Flora of Siam —Additamentum xxxviii, by the late W. G. Craib (K.B. 1933, 18).

The structure and botanical identity of some scented woods from the East (K.B. 1933, 3).

Petrosavia and Protolirion (K.B. 1933, 156).

Additions to the Flora of Borneo and other Malay Islands : IV, by H. N. Ridley (K.B. 1933, 190).

Dioscoreaceae Novae Asiaticae, by D. Prain and I. H. Burkill (K.B. 1933, 240).

New or little-known plants from South India : II (K.B. 1933, 339).

Contributions to the Flora of Burma : XI (K.B. 1933, 364).

Contributions towards a Flora of British North Borneo : III, by H. N. Ridley (K.B. 1933, 487).

AFRICA.

The amount of material received for identification has been, as usual, very considerable, the majority being from East Tropical Africa, as was the case last year. In order to save time several collections from each particular colony or dependency have been sorted together and named concurrently. In this way repetition in comparison of species, especially of large genera, has been as much as possible avoided.

Part 6 of vol. 9 of the " Flora of Tropical Africa " was published on January 1st, 1934. This part completes the account of the subfamily *Panicoideae* and contains the index to the volume.

Steady progress has been made in the preparation of the final part of the " Flora of West Tropical Africa." Pending the completion of the account of the *Orchidaceae, Gramineae* and *Filices,* the general MS. for the Monocotyledons has been used in naming collections from West Africa and additions have been included from time to time. Dr. J. M. Dalziel, although laid up for several months by a serious illness, has resumed work on the Economic Appendix, which is nearly finished. A collection from French West Africa, made by M. Pobéguin, has been named and included in the Flora.

The Supplement to the "Flora Capensis," containing an account of the Gymnosperms, was published in March, thus bringing to an end a long and arduous task begun by Harvey and Sonder in 1859.

An important paper published during the year was an enumeration of the plants collected on Mt. Elgon by Major E. J. Lugard and others. This occupied the greater part of K.B. 1933, no. 2.

WEST TROPICAL AFRICA.—From Sierra Leone Mr. F. C. Deighton and Mr. R. R. Glanville have continued to supply collections. The following contributions have also been received: from Liberia, 235 specimens collected by Dr. G. W. Harley; Gold Coast, specimens collected by Dr. F. R. Irvine (including many plants cultivated at the Aburi gardens), Mr. C. Vigne and Mr. T. Lloyd Williams; Nigeria, by Messrs. I. D. Hepburn, A. F. Ross, A. S. Thornewill, F. D. Golding, and C. B. Taylor, including numerous grasses; French Sudan, by Mr. O. B. Lean. General collections from this region were received from Dr. O. Hagerup, the Arnold Arboretum, Harvard University, and the Imperial Forestry Institute, Oxford.

CAMEROONS AND CONGO.—A collection of duplicates of grasses, the majority of which are named, has been received from the Brussels Botanic Garden, and a small collection of *Cyperaceae* and *Gramineae* from Mr. T. D. Maitland.

NORTH-EAST TROPICAL AFRICA.—A very fine collection of over 1600 numbers was made in Somaliland and Abyssinia by Mr. J. B. Gillett whilst attached to the British Somaliland-Ethiopia Boundary Commission (see p. 4). Of most of the specimens several duplicates will be available for distribution. A useful supplementary collection has since been received from Major H. C. Godding, an officer of the Commission. From the Sudan, Major G. Aylmer has presented further material, and Mr. W. B. K. Shaw a collection of 41 specimens from the Libyan Desert.

EAST TROPICAL AFRICA.—Messrs. N. V. Brasnett, W. J. Eggeling, and C. M. Harris, of the Uganda Forestry Department, continue to send most valuable collections, mainly of trees and shrubs. About 1300 specimens were received from the Agricultural Department, Uganda, collected by Messrs. P. Chandler, C. Hazel, V. E. Henderson, H. B. Johnston and A. S. Thomas. Corresponding departments in Kenya Colony have also added their quota; Agricultural Department: by Messrs. V. A. Beckley, D. C. Edwards, M. D. Graham, and A. C. Maher; Forestry Department: Messrs. I. R. Dale, H. M. Gardner and others. Miss E. R. Napier and others have forwarded duplicates of collections gathered for the Coryndon Memorial Museum, and a further collection of Mt. Elgon plants by Mr. T. H. E. Jackson has been received, whilst several consignments have been received from Mr. C. Gilbert Rogers and Mrs. D. R. Tweedie.

Most valuable collections have again been received from Tanganyika Territory, including a large consignment of 854 specimens made by Mr. G. B. W. Wallace (Mycologist), about 250 of these being from Mafia Island; also a well prepared collection of 411 specimens from around Shinyanga by Miss R. D. Bax (including some water-colour sketches); further specimens have been received from the Agricultural Department collected by Messrs. R. B. Allnutt, R. M. Davies, V. F. Jessel, and N. V. Rounce. Mr. B. D. Burtt has continued to send most useful material, mainly from the mountains, whilst Mr. P. G. Greenway has forwarded several consignments collected by himself and others, including Messrs. H. E. Emson, C. Harvey, R. E. Moreau and R. R. Staples. A small collection of medicinal plants was received from Prof. T. K. Penniman, University Museum, Oxford, and further material from Mr. G. W. St. Clair Thompson.

SOUTH TROPICAL AFRICA.—The amount of material from this geographically important region has been less than usual. Mr. F. Eyles has sent small collections from Southern Rhodesia and Mr. C. G. Trapnell about 170 specimens, mainly grasses, from Northern Rhodesia. A set of 18 new species of *Gramineae* has been received from Miss Stent. Small collections of herbs have been forwarded by the Imperial Forestry Institute, Oxford. From the Department of Agriculture, Nyasaland, have been received small collections, including specimens of Rices and Sorghums. Senhor A. F. de Gomes e Sousa has again sent about 200 plants for determination from Portuguese East Africa, and Mr. J. Gossweiler 420 from Angola. Good general collections from this South Tropical region are much desired.

MASCARENE ISLANDS.—Several small consignments, including a set of palms, have been received from Mr. R. E. Vaughan.

Research and Publications.—During the year a revision of the giant Lobelias of East Africa has been prepared and will be published in the " Kew Bulletin " early in 1934. A critical enumeration of Mr. Gillett's important collection from Somaliland and Abyssinia has been partly carried out. Mr. V. S. Summerhayes and Mr. F. Ballard have devoted as much time as possible to West African Orchids and Ferns respectively.

The following papers have been published :—

The Flora of Mt. Elgon, with an Introduction by E. J. Lugard (K.B. 1933, 49).

Tropical African Plants: X and XI (K.B. 1933, 142 and 467).

New Trees and Shrubs from Tropical Africa, by A. C. Hoyle & H. Dunkley: II (K.B. 1933, 170).

Central African Canoes (K.B. 1933, 202).

African Orchids: V (K.B. 1933, 246).

Notes on African Grasses: XIII and XIV (K.B. 1933, 269 and 498).

The Genus Trichocladus (K.B. 1933, 427).

Agave amaniensis: A new form of Fibre-producing Agave from Amani (K.B. 1933, 465).

SOUTH AFRICA.—Over 800 specimens were received from the National Herbarium, Pretoria, mostly for identification or verification. Particularly good and well prepared collections were received from Capt. T. M. Salter, R.N., including a very fine series of specimens of the genus *Oxalis*, which is usually not well represented in herbaria owing to difficulty in drying; also another excellent set of specimens from Mr. F. R. Long, Port Elizabeth, and a small collection from Mrs. M. C. Gillett. The Curator of the Bolus Herbarium kindly allowed the extraction of portions of specimens of new species not represented at Kew. These have now been presented and form a most valuable addition to the collections. Small donations have been received from the Albany Museum, the Natal Herbarium, the Transvaal Museum and from Dr. J. Muir, Riversdale.

In connection with his work on the "Flora of Albany and Bathurst," Mr. R. A. Dyer has received and revised the determinations of about 1600 mounted specimens from the Albany Museum, Grahamstown.

About 60 specimens were purchased from Mr. E. G. Bryant, Prieska Division.

Research and Publications.—The Vegetation of Schoemanskloof, Eastern Transvaal, by J. C. Smuts (K.B. 1933, 417).

Notes on the Flora of Southern Africa: IV (K.B. 1933, 459).

AMERICA.

During the year 13,062 sheets have been mounted, and over 5500 sheets have been incorporated.

The largest and most interesting collection received is undoubtedly that of Mr. G. B. Hinton, from the district of Temascaltepec, Mexico. Mr. Hinton is making an exhaustive collection of the vegetation of the district, and his numbers already run into several thousands. Of these the *Leguminosae* and certain other polypetalous families have been examined and named. In the early part of the year several hundred undetermined sheets were forwarded for naming from the Jenman Herbarium, Georgetown, British Guiana. These included material of some rare and new species, and duplicate sheets of many of them were retained, through the kindness of the Department of Agriculture. Among the other collections which were studied have been those of Miss Dora B. Stafford from Peru, of Mr. A. E. Lawrance from the State of Boyacá, Colombia, and Mr. Clarence Elliott's second collection from Chile.

Several weeks were spent in collaboration with Mr. R. O. Williams, of the Department of Agriculture, Trinidad, in checking the typescript of his account of the important families *Melastomaceae* and *Myrtaceae* for the "Flora of Trinidad and Tobago." Mr. Williams has most generously selected a large series of duplicates of species of these families for presentation to Kew.

Very valuable series of specimens, either through presentation, purchase or exchange, have come in from all parts of America. In addition to those already referred to, the collections of Miss I. W. Hutchison in Alaska, and of Mr. F. S. Chapman in Greenland may be mentioned, also duplicate *Salices* from the National Museum of Canada and from the University of California, Berkeley; a fine series of tropical American and Peruvian duplicates from the Field Museum, Chicago; and a set of *Bignoniaceae*, collected in Brazil and Peru by Mrs. Ynes Mexia, presented for naming by Mrs. H. P. Bracelin, of the University of California, Berkeley.

The following collections were also received:—

NORTH AMERICA.—*Presented*: Labrador, by the Gray Herbarium, Harvard University (coll. E. C. Abbe and H. Bishop); United States, by Dr. F. A. Rodway, Nowra, New South Wales (California plants, coll. L. S. Rose); Pomona College, Claremont, California (coll. mainly P. A. Munz); Dr. D. D. Keck, Stanford University, California; and by the Bureau of Plant Industry, United States Department of Agriculture, Washington (bamboos).

CENTRAL AMERICA.—*Presented*: Panama, by the Botanical Museum, Harvard University (Orchids). *Purchased*: Mr. W. A. Schipp, British Honduras plants.

WEST INDIES.—*Purchased*: Mr. W. E. Broadway, Trinidad plants; Prof. G. Samuelsson, *Cyperaceae* from Haiti, collected by the late E. L. Ekman; Mr. E. J. Valeur, Dominican Republic plants.

EAST TROPICAL SOUTH AMERICA.—*Presented*: Brazil, by the Riksmuseum, Stockholm, and by the Gray Herbarium, Harvard University. *Purchased*: New York Botanical Garden, Amazonian plants (coll. B. A. Krukoff).

WEST TROPICAL SOUTH AMERICA.—*Presented*: Ecuador, by the Botanical Museum, Oslo University. *Purchased*: New York Botanical Garden, Colombian plants (coll. A. E. Lawrance); United States National Museum, Peruvian plants (coll. G. Klug); Mr. T. O. Weigel, Herbarium Bolivianum, by Buchtien, cent. viii, and nos. 1–50, cent. ix.

TEMPERATE SOUTH AMERICA.—*Presented*: Argentine, by Mr. A. Burkart; Prof. J. F. Molfino; Prof. L. R. Parodi; the Museo Nacional de Historia Natural, Buenos Aires (*Nototriche*, *Malvastrum* and *Lilaeopsis*); and by the Bureau of Plant Industry, United States Department of Agriculture, Washington (Grasses, coll. S. Venturi). *Purchased*: Dr. A. Donat, Plantae Patagonicae, cent. iv.

Research and Publications.—The following papers have been published during the year:—

Sarracenia purpurea var. stolonifera, by John M. Macfarlane and D. Walter Steckbeck (K.B. 1933, 161).

Notes on the Trinidad and Tobago species of Lauraceae, by R. L. Brooks (K.B. 1933, 209).

The genus Ceratophytum (K.B. 1933, 321).

New species and first records from British Guiana, mainly collected by Mr. T. A. W. Davis (K.B. 1933, 323).

The genus Strychnos in British Guiana and Trinidad (K.B. 1933, 390).

New species of Nototriche and Malvastrum from the Argentine (K.B. 1933, 485).

Three new species from British Guiana (K.B. 1933, 495).

AUSTRALIA, NEW GUINEA AND NEW ZEALAND.

During the year approximately 1600 specimens have been mounted and 1800 sheets incorporated. Routine work included the answering of queries received from various sources. Numerous specimens of grasses were received for identification from the Brisbane Herbarium, and 110 of these have been named, including a valuable collection made by Mr. L. J. Brass in North Queensland which contained several additions to the Queensland flora. Prof. J. B. Cleland presented a further collection of grasses from areas in South and Central Australia poorly represented at Kew. Dr. K. Domin kindly continued to lend type specimens from his Queensland collections, which have been of great assistance in the identification of Australian grasses.

Further instalments of useful material, mostly from New South Wales, were received from Dr. F. A. Rodway, and valuable collections of Queensland plants from Mrs. E. Thomson and the Brisbane Herbarium. A small set of named duplicates of plants collected by Mr. S. F. Kajewski in Queensland was presented by the Arnold Arboretum, Harvard University.

From New Guinea an interesting collection was received from Miss L. E. Cheesman, and a small consignment of named specimens collected by Mr. L. J. Brass from the Arnold Arboretum. A small but interesting collection of orchids was sent by the Department of Agriculture and has been named.

Research and Publications.—The detailed study of the Australian and New Zealand Gaultherias and Pernettyas and their relationships with allied genera was continued.

OCEANIA.

During the period under review 695 specimens have been mounted and 575 sheets incorporated. Material received from this area was about the same in quantity as in previous years, but owing to lack of time little progress has been made with the naming of the collections. The Solomon Islands have again provided the largest accessions, including plants collected by Mr. J. H. L. Waterhouse, sent direct or for determination by the School of Forestry, Yale University. Mrs. C. J. Parham forwarded further material from Fiji. A large number of named specimens, mostly from Hawaii, but also including many Fiji plants collected by the late Dr. J. W. Gillespie, was received from the Bernice P. Bishop Museum, Honolulu, while the Arnold Arboretum presented a set of specimens collected in New Caledonia by Mr. I. France.

Work was continued on the Santa Cruz Islands collection made by Mr. S. F. Kajewski and also on figs collected in Samoa and sent for determination by the Bernice P. Bishop Museum.

PTERIDOPHYTA.

More than 1800 sheets were incorporated during the year while many hundreds more awaiting incorporation were arranged in alphabetical sequence of genera in separate cabinets.

No large additions to the fern collections have been presented during the year. Amongst the more interesting sets received were: (1) 130 specimens collected by Brig.-Gen. F. E. W. Venning in the Murree Hills, N.W. Himalayas; (2) more than 160 specimens from Mexico collected by Mr. G. B. Hinton; these were excellent specimens upon which much care had obviously been expended; (3) 70 specimens from Yunnan, presented by the Fan Memorial Institute of Biology, Peiping; (4) a set of 90 specimens collected in the Fiji and Society Islands by the late Dr. J. W. Gillespie and Dr. M. L. Grant respectively.

The investigation into the fern flora of West Africa in connexion with the fourth part of the " Flora of West Tropical Africa " has been continued, although, owing to the large amount of routine work, progress has been slower than had been hoped.

MUSCI, HEPATICAE AND CHAROPHYTA.

An interesting and little known economic use of mosses was brought to light by enquiries concerning *Sphagna* from the Government Chemical Research Laboratories. Hitherto the supplies of ' moss litter ' used as a ' tell tale ' to be mixed with tobacco waste on which the duty had been refunded, were obtained from sources on the continent. An investigation was made of the various samples brought to Kew, sample gatherings of various species of the genus were collected, and after study of the problem it was suggested that if a supply of pure *Sphagnum* obtained from certain areas in the country was used instead of the mixed ' litter ' a much smaller percentage would be required with correspondingly increased economy and efficiency.

During the year a collection of British Columbian mosses made by Mrs. R. Morris was received for identification and a number of named mosses collected by Dr. A. F. G. Kerr in Siam was presented by Mr. H. N. Dixon. Series 5 and 6, Hepaticae Selectae et Criticae, were purchased from Mr. Fr. Verdoorn. In addition to several small British collections, a number of critical New Zealand hepatics collected by Mr. K. W. Allison have been named.

Mr. C. V. B. Marquand continued his studies on arctic-alpine bryophyte ecology, in the course of which he visited islands in the Hebrides during his ordinary leave.

Research and Publications.—Report of the Excursion of the British Bryological Society to Norway in July–Aug. 1932 (Rep. British Bryol. Soc. 1932, **3**, 19 : 1933).

A short paper, " Riccia Beyrichiana in Arctic Europe," has been prepared for the " Journal of Botany," and one was read before the Linnean Society entitled " The Vegetation of the Island of Rum " (Proc. Linn. Soc. pt. 1, session 1933–34, in the press).

THALLOPHYTA.

ALGAE.—Considerable time was as usual spent in naming small British collections, and answering miscellaneous enquiries. Material has been acquired from the Central Experimental Farm, Ottawa, Canada ; Prof. F. Boergesen (Danish West Indies and India) ; the Independent Biological Laboratories, Tel Aviv, Palestine ; and from the Lingnan University, Canton, China. The large number of Indian specimens sent on loan to Prof. F. Boergesen for his work on the algae of Bombay has been returned and incorporated. His revised determinations include several new species.

Prof. T. A. Stephenson has continued to send algae collected during his general biological survey of selected districts of the South African coast. A representative set has been presented to Kew including some new species and others not represented in the Herbarium.

As a result of a request from the Botany School, Cambridge, Miss C. I. Dickinson visited Scolt Head Island, Norfolk, to collect and identify the marine algae and lichens in connexion with the biological survey of that area which is being undertaken by Mr. V. J. Chapman. Two short visits were paid and the results will be incorporated in a handbook to Scolt Island, to be produced early in 1934 by the Norfolk and Norwich Naturalists' Society.

Research and Publications.—Some Indian Rhodophyceae especially from the shores of the Presidency of Bombay : III, by F. Boergesen (K.B. 1933, 113).

LICHENS.—Numerous small collections presented to Kew, several of which required identification, have been dealt with and laid in. A considerable amount of material has been sent on loan from Kew.

In connexion with the Scolt Survey (see above) Miss C. I. Dickinson spent a week on the island in November for work on lichens. This resulted in the collection for Kew of a set of excellent material of all the lichens found on the island. Some noteworthy fungus records were also added.

FUNGI.—A large accumulation of arrears of laying in and of specimens for distribution has been dealt with, largely with the help of a temporary assistant provided in the latter part of the year. The incorporation has now been brought up to date, and sets of duplicates have been distributed to the Farlow Herbarium, United States Department of Agriculture, Berlin and Paris, as well as to specialists who have contributed material of groups studied by them.

Miscellaneous enquiries were again very numerous, and have covered a varied field, including, for instance, diseases of horticultural plants, the examination of fungi on mine timbers from South Africa, and the identification of fungi growing in mushroom beds. Loan transactions have been fewer than usual, but on the other hand requests from research workers in other parts of the world for the critical examination of types and comparison of material continue to increase. Such enquiries referred, amongst others, to the following groups: *Xylaria* spp. from Prof. J. H. Miller, University of Georgia, U.S.A., and resupinate *Hydnaceae* from Prof. G. W. Martin, University of Iowa.

Among the larger collections of fungi received for naming were consignments from India (Rev. G. Foreau and Dehra Dun Forest Research Institute), Sarawak (Oxford University Expedition), China (Lingnan University, Canton), Uganda (Mr. C. G. Hansford), Kenya (Mr. C. A. Thorold), and South Africa (Miss A. M. Bottomley and Prof. P. A. van der Byl).

Collections presented include: *Ustilagineae*, collected by Dr. G. L. Zundel, *Coleosporium* spp. collected by Dr. G. G. Hedgcock and miscellaneous fungi from the collections of the late Ellsworth Bethel (Bureau of Plant Industry, United States Department of Agriculture); Basidiomycetes (Prof. L. O. Overholts); various lower Basidiomycetes (Prof. G. W. Martin); decades i and ii, Fungi Polonici Selecti Exsiccati, and miscellaneous fungi (Kornik Institute). Fascs. 1 and 2, Fungi Carpatici Exsiccati were purchased from Dr. A. Pilát.

Research and Publications.—An investigation into the method of overwintering of *Botrytis elliptica* Cooke—the cause of leaf spot disease in *Lilium candidum*—was undertaken by Miss M. R. F. Taylor. Evidence was obtained that, in addition to infection by spores derived from germinating sclerotia, lesions on the old basal leaves containing living mycelium produce conidia in April which can bring about infection of the young shoots.

Preliminary List of Diseases of Economic Plants in British Guiana, by E. B. Martyn (K.B. 1933, 107).

Detection and Control of Lily Disease, by A. D. Cotton. The Lily Year-Book 1933, 194.

BIOLOGICAL AND GENETICAL HERBARIA.

About 2200 sheets have been added to these collections during the year. These include: (1) additional material illustrating the ecological survey of Richmond Park; (2) large series of specimens to show the range of variation in salt marsh, sand dune, and shingle plants, from Norfolk; (3) further specimens connected with breeding work in *Anthyllis*, *Saxifraga*, *Ranunculus*, *Silene*, and *Centaurea*; (4) a complete set of scored specimens to illustrate ecotype and biotype variation in high mountain campions (*Silene glareosa*, *S. alpina*, *S. vulgaris*); (5) a set to illustrate variation, etc., in the genus *Zostera*; (6) numerous specimens of various genera filling in gaps in the life-history and plasticity series of British plants.

SUMMARY.

The routine work, apart from naming, accomplished during 1933 is summarised as follows:—

Mounted	57,650 (approx.)
Incorporated	44,300 (approx.)
Duplicates distributed	6,571
Specimens received on loan	9,408
Specimens sent out on loan	6,136
Specimens presented or purchased ...	69,847

Miss M. M. Whiting continued to give very valuable voluntary help in arranging and classifying the Indo-Malayan material and during the latter part of the year similar assistance was provided by Miss M. R. F. Taylor and Miss D. A. Chaytor in the African and European departments respectively.

ILLUSTRATIONS AND PORTRAITS.

The routine work of preparing drawings and taking photographs has again been heavy. About 250 sheets of type or authentic specimens borrowed from other herbaria have been photographed for the Kew collection, and about 700 sheets of Kew specimens have been photographed for other institutions.

At the beginning of the year the scheme for re-arranging the entire collection of drawings (including published illustrations) so as to bring them nearer to the corresponding herbarium specimens was brought into operation. Except in the case of very large drawings, each one was remounted on an ordinary herbarium sheet. These are being incorporated in cabinets in the same wing of the Herbarium, and as far as possible on the same floor, as the specimens to which they are related. Those drawings which are larger than the size of herbarium sheets remain on their original mounts and are kept as a separate collection.

Some 7000 drawings and photographs were mounted during the year and the work is nearly complete.

Amongst those received and incorporated were the following:—61 original water-colour drawings prepared for the "Botanical Magazine" and 79 drawings and photographs, presented by the Royal Horticultural Society; 40 plates of the Flowering Plants of South Africa, from Dr. I. B. Pole Evans; 72 photographs from the

Field Museum, Chicago; 141 photographs of type-specimens in European herbaria, from Dr. Maxon, U. S. National Herbarium, and numerous plates of *Dioscorea* species to appear in the " Annals of the Royal Botanic Gardens, Calcutta," presented by Mr. I. H. Burkill. Other drawings and photographs have been received from numerous sources. A large number of photographs of type specimens not at Kew has been mounted in envelopes and placed in the herbarium.

Two parts of " Hooker's Icones Plantarum " appeared, ser. 5, vol. 2, pt. 4 in May, and vol. 3, pt. 1 in December. An important function of the " Icones " is the illustration and description of unique and rare plants represented in the Kew herbarium. One of the chief impediments to the progress of systematic botany is the fact that many new species are based on single specimens or sheets, and in such cases adequate figures with the necessary dissections are invaluable. As examples, the very rare Asclepiads, *Fockea cylindrica* (Hook. Ic. Pl. t. 3221), and *F. gracilis* (t. 3222) may be mentioned. Each is known only from a single locality in the Albany Division, South Africa.

NOMENCLATURE, TERMINOLOGY AND BIBLIOGRAPHY.

The preparation of new editions of the handlist of " Rock Garden Plants " and of "Trees and Shrubs" has entailed a great amount of nomenclatural as well as taxonomic research and a considerable amount still remains to be done. An increasing number of enquiries is received from correspondents desiring information and advice on problems connected with nomenclature and bibliography. Six nomenclature papers and two notes have appeared during the year in addition to two papers concerned with bibliography.

In conjunction with two botanists from abroad a paper on the conservation of certain generic names is being prepared. At the Sixth International Botanical Congress held at Cambridge in 1930 it was decided that later homonyms should be rejected even if the earlier name is illegitimate or is generally treated as a synonym on taxonomic grounds. It is, therefore, considered advisable to make a systematic search for later generic homonyms and in each case to decide whether or not the names shall be proposed for conservation at the next botanical congress to be held in Amsterdam in 1935.

An important contribution to the history of botany was made by the publication of glossaries of botanical terms used in the first, seventh and thirteenth centuries by the elder Pliny, Isidorus of Seville, and Albertus Magnus respectively. An article on plant morphology in Albertus Magnus sheds light on the morphological concepts held by the greatest botanist of the thirteenth century, remarkable instances of reasoning from homology being given.

A condensed account of the principal provisions of the International Rules of Botanical Nomenclature was prepared (see below). This has been found of great use pending the appearance of the third edition of the "International Rules." A paper entitled "Rules of Botanical Nomenclature" originally published in the "Empire Forestry Journal" for 1931 was reprinted in China in July, 1933, primarily for the use of the university students of Canton.

Publications.—Nomenclature: Eragrostis major and E. minor (K.B. 1933, 15).

Silene Cucubalus: the correct name of the Bladder Campion (K.B. 1933, 151).

The History of Nothopanax (K.B. 1933, 154).

Northea Hornei or N. seychellana (K.B. 1933, 206).

Plant Nomenclature (B.E.C. Report, 1932, 300: 1933).

Podostemaceae or Podostemonaceae (K.B. 1933, 46).

Abies pindrow (K.B. 1933, 414).

Nomenclature of some Australian and Philippine Islands Plants, by C. T. White (K.B. 1933, 45).

Terminology: Botanical Terms in Pliny's Natural History (K.B. 1933, 30).

Botanical Terms in Isidorus (K.B. 1933, 401).

Plant Morphology in Albertus Magnus (K.B. 1933, 431).

Botanical Terms in Albertus Magnus (K.B. 1933, 440).

Bibliography: The Dates of Hooker's "Companion to the Botanical Magazine" (K.B. 1933, 362).

Dates of publication of Royle's "Illustrations" (K.B. 1933, 378).

INDEX KEWENSIS.

The first proof of "Index Kewensis Supplement VIII" was received on January 10th and the last sheet of revised proof was returned to the Press on September 29th with the result that, thanks to the promptness of the Clarendon Press, the Supplement appeared in November. This Supplement therefore appeared less than three years after the end of the quinquennium, thus returning to the time taken for publication in pre-war days. It also appears four years after the publication of Supplement VII in 1929.

The plan of Supplement VIII is similar to that of Supplement VII and its size is approximately the same. The alphabetical list of new genera under their families as an appendix to the Supplement is continued, as it has proved such a very welcome and useful innovation in Supplement VII. Supplement VIII covers the quinquennium 1926–30, and thus another stage in the history of the "Index Kewensis" closes, for in order to conform to the International Rules and Recommendations as revised at Cambridge in 1930, the method of citation in the next Supplement will be slightly different from that hitherto adopted. For instance, in citing a new combination the original author's name will be included in brackets immediately after the specific epithet and the author of the new combination will follow, e.g. *Gentiana angustata* (C. B. Clarke) Marquand in Kew Bull. 1931, 70: *Crawfurdia angustata*. The comma between the specific epithet and the author's name will be omitted.

The compilation of Supplement IX (1931–35) is now in progress and there are already about 3000 new names in the card catalogue, arranged alphabetically, and available for consultation by the Kew staff and visiting botanists.

SEED COLLECTION.

Messrs. Sutton & Sons, James Carter & Co., and J. MacDonald have presented packets of seeds of their lawn grasses. A small quantity from each sample has been incorporated in the seed collection and the remainder has been sown in the Gardens in order to obtain herbarium specimens. In addition about 150 miscellaneous packets of seed have been added to the collection during the year. It has been much used, especially in connection with the identification of Near Eastern and other drug-yielding fruits and seeds.

An almost complete set of seeds of the genus *Lilium* was prepared for exhibition at the Royal Horticultural Society's Lily Conference, and is now on view in Museum no. 1.

EXPERIMENTAL AND TRANSPLANT WORK.

Research was continued at Potterne and Kew on *Silene*, *Centaurea*, and *Saxifraga*. A large number of generations of high mountain plants of *Silene* were analyzed for comparison with lowland populations and F_2 generations involving colour and indumentum of vegetative parts in *S. vulgaris* were scored. F_2 generations of interspecific crosses in *Centaurea* flowered on the new ground and about 1400 plants were scored. The breeding research on the cross *S. rosacea*×*S. granulata*, its reciprocal, and back-crosses, has, it is hoped, been completed. Preliminary investigations of a statistical-genetical nature have been commenced on petal size and shape within the species *S. granulata*. Work on *Anagallis* is proceeding.

The transplant experiments are being continued and a third report has been prepared giving details of the results obtained to the end of 1933, i.e. for the last two of the six years during which the experiments have been conducted. This report will be published in due course in the "Journal of Ecology."

Publications.—Researches on Silene maritima and S. vulgaris: XI–XII. (K.B. 1933, 357, 479).

Notes on the Taxonomy of British Material of Anthyllis Vulneraria. (Journ. Bot. **71**, 207: 1933).

Studies in Variation of Anthyllis Vulneraria (Journ. Genetics, **27**, 261: 1933).

Second Report on the Transplant Experiments of the British Ecological Society at Potterne, Wilts. (Journ. Ecol. **21**, 268: 1933).

VISITORS.

The number of signatures in the Visitors' Book for 1933 was 5263. Amongst frequent or regular visitors were members of the staffs of the Department of Botany, British Museum; Imperial Mycological Institute; and also that employed by the Royal Horticultural Society on the Index Londinensis and Botanical Magazine.

In addition, the most noteworthy or frequent visitors to the Herbarium were the following:—

Major G. Aylmer, Khartoum.

Mr. E. G. Baker; Mr. W. J. Bean; Mr. L. A. Boodle; Dr. G. A. Boulenger, Brussels; Prof. C. E. B. Bremekamp, Utrecht; Dr. N. E. Brown; Prof. A. H. R. Buller, Winnipeg; Mr. I. H. Burkill; Dr. E. J. Butler.

Mr. W. S. Chamberlain; Mr. Chao-chien Chang, Nanking; Mr. E. J. H. Corner, Singapore; the late Prof. W. G. Craib.

Dr. J. M. Dalziel; Dr. J. Burtt Davy; Mr. H. N. Dixon; Mr. H. Dunkley.

Mr. J. Ehrlich, Cambridge, Mass.

Dr. H. R. Fletcher; Dr. F. W. Foxworthy, Kepong, F.M.S.

Miss S. Garabedian, Cape Town; Mr. J. B. Gillett; Mr. W. B. Grove; Mr. E. R. Guest, late of Iraq.

Dr. D. Hooper; Mr. A. C. Hoyle.

Dr. I. M. Johnston, Arnold Arboretum; Mr. Sven Junell, Uppsala.

Dr. A. F. G. Kerr; Miss J. Th. Koster, Leiden.

Mr. J. E. Lousley.

Prof. N. Malta, Riga.

Miss A. A. Obermeyer, Pretoria; Dr. S. J. van Ooststroom, Utrecht.

Mr. W. R. Philipson: Mr. F. J. Pound, Trinidad; Mr. W. R. Price.

Prof. H. W. Rickett, Columbia, Mo.; Mr. H. N. Ridley.

Mrs. C. Sandwith; Monsieur M. Simonet, Paris; Dr. Lyman B. Smith, Gray Herbarium; Mr. J. D. Snowden; Miss M. S. Sprague; Mr. W. T. Stearn; Mr. Duncan Stevenson; Mr. P. M. Synge.

Mr. A. W. Trethewy; Mr. T. G. Tutin.

Mrs. M. L. Wedgwood; Mr. R. O. Williams, Trinidad.

DISTRIBUTION OF DUPLICATES.

The following were the principal institutions to which duplicates were distributed:—

Great Britain and Irish Free State.—Aberdeen, Cruickshank Botanic Garden; British Museum (Natural History); Oxford, Imperial Forestry Institute; Dublin, Trinity College.

Europe and Orient.—Baku, Herbarium of the U.S.S.R. Academy of Sciences; Belgrade, Botanic Gardens; Berlin, Botanic Gardens and Museum; Brno, Masaryk University; Brussels, Botanic Garden; Florence, Botanical Institute; Paris, Natural History Museum; Sarajevo, State Museum; Sofia, University, Department of Botany; Stockholm, Botanical Museum; Uppsala, Botanical Institution; Utrecht, University Botanic Museum and Herbarium;

Vienna, Natural History Museum; Zürich, Botanic Garden and Museums.

Africa.—Nairobi, Coryndon Memorial Museum; Amani, East African Agricultural Research Station; Pretoria, Division of Plant Industry.

Asia.—Canton, Sun Yat-Sen University; Singapore, Botanic Garden.

Australia.—Brisbane, Botanic Museum and Herbarium.

Oceania.—Honolulu, Bernice P. Bishop Museum.

America.—Ottawa, Central Experimental Farm; Harvard University, Farlow Herbarium and Gray Herbarium; Pennsylvania, State College; Washington, U.S. Department of Agriculture, Bureau of Plant Industry.

The Library.

The most important presentations received in the Library during 1933 are as follows:—

The Bentham-Moxon Trustees have presented a number of valuable works, including about fifty books, published and in manuscript, and 350 botanical tracts, from the library of the late Dr. O. Stapf. Three other important items presented are: G. Bonnier, *Flore complète, illustrée en couleurs, de France, Suisse et Belgique*, 11 vols. (bound), 1911–31; S. Curtis, *Beauties of Flora*, 1806–20, title-page and 8 plates, which complete the Kew copy of this sumptuous work, hitherto represented by two plates only; S. Taylor, 47 *paintings of plants*, c.1760. Taylor, who died in 1772, was a botanical painter employed by the Earl of Bute to make drawings of rare plants at Kew. The above collection is probably a portion of these Kew drawings. Other gifts from the Trustees include: L. Colla, *Herbarium Pedemontanum*, 8 vols., 1833–37; C. Gesner, *De raris et admirandis herbis*, 1555; Mrs. M. Grieve, *A modern herbal*, 2 vols., 1931; T. Panckow, *Herbarium portatile*, 1654 (the rare first edition); R. Parnell, *The grasses of Britain, Illustrated*, 1845; and N. Winckler, *Chronica herbarum*, 1571.

As in previous years volumes or parts in continuation of several periodicals, received in exchange for *Hooker's Icones Plantarum*, have been presented by the Bentham-Moxon Trustees.

From the Royal Horticultural Society have been received the *Classified list of daffodil names*, the *Daffodil Year-Book*, and the *Lily Year-Book*, all published in 1933. A bound copy of the last mentioned has been sent by Major F. C. Stern. The Society has also presented its *List of awards to decorative plants, fruits and vegetables*, 1927–31, and *List of awards given to orchids* . . . 1859–1915, 1916–24, 1925–26, and 1927–31 (2 copies of each of the four lists).

Lieut.-Col. Sir David Prain has presented the continuation of various periodical and other publications.

Dr. Sydney H. Long, Honorary Secretary of the Norfolk and Norwich Naturalists' Society, has given to the library, on behalf of the Society, an almost complete set of their *Transactions*, which date from 1869.

Chief among the publications received during 1933 from the New York Botanical Garden are *Addisonia* and the *North American Flora*, both in continuation.

The following books have been received from the publishers, chiefly for review in the " Kew Bulletin " : From Messrs. Edward Arnold and Co. : S. Burr and Dorothy M. Turner, *British economic grasses : their identification by the leaf anatomy*, 1933 ; F. K. Ward, *Romance of plant hunting*, ed. 2, 1933. From the Crown Agents for the Colonies : D. A. Bannerman, *Birds of Tropical West Africa*, vol. iii, 1933. From Messrs. E. & S. Livingstone : J. M. Watt, and Maria G. Breyer-Brandwijk, *Medicinal and poisonous plants of Southern Africa*, 1932. From Messrs. Macmillan : C. T. Simpson, *Florida wild life*, 1932. From Sir Isaac Pitman & Sons : H. S. Redgrove, *Spices and condiments*, 1933. From Messrs. Ward, Lock & Co. : A. Osborn, *Shrubs and trees for the garden*, 1933.

The more important publications received from the Editor of Nature are : L. H. Bailey, *The cultivated conifers*, 1933 ; J. Braun-Blanquet, *Plant sociology . . . translated by G. D. Fuller and H. S. Conard*, 1932 ; C. T. Green, *Flora of the Liverpool district*, 1933 ; H. W. Kew, and H. E. Powell, *Thomas Johnson, botanist and royalist*, 1932 ; A. C. Mahr, *The visit of the " Rurik " to San Francisco in* 1816, 1932 ; G. E. Post, *Flora of Syria, Palestine and Sinai*, ed. 2, *. . . by J. E. Dinsmore*, vol. I, 1932 ; C. E. Salmon, *Flora of Surrey, edited by W. H. Pearsall*, 1931, and F. Verdoorn (Editor), *Manual of Bryology*, 1932.

The more important independent works received include the following presented by the authors unless otherwise stated : H. H. Allan, *New Zealand trees and shrubs*, 1928 (from Dr. F. A. Rodway) ; L. H. Bailey, *Gentes Herbarum* vol. II, fasc. 7, 1932, and vol. III, fasc. 1–3 ; Mrs. H. M. L. Bolus, *Notes on Mesembrianthemum and allied genera*, pt. 2, pp. 377–396 (3 copies) ; A. Borza (Editor), *Guide de la Sixième Excursion phytogéographique internationale, Roumanie*, 1931, 1931 ; L. Chalk, and J. Burtt Davy (Editors), *Forest trees and timbers of the British Empire*, II ; *Twenty West African timber trees* (2 copies, from the Oxford University Press and the Imperial Forestry Institute, Oxford) ; J. Copeland, *Manual of Arboriculture for Burma, revised edition*, 1932 (from the Government Press, Rangoon) ; O. Degener, *Flora Hawaiiensis*, about 100 ff. ; É. De Wildeman and P. Staner, *Contribution à l'étude de la flore du Katanga, suppléments* IV *and* V (from Comité Special du Katanga) ; É. De Wildeman, *Plantae Bequaertianae*, vol. V, fasc. 5, 1932, and vol. VI, fasc. 1 ; K. Domin, *Pteridophyta* (an illustrated monograph) 1929 ; P. F. Fyson, *Flora of the South Indian Hill Stations*, 2 vols, 1932 ; Mr. J. H. Heucher, *Magic plants : being a translation of a curious tract . . . by M. J. H. H.* (1700), *edited by E. Goldsmith*, 1886 (from Mr. H. G. Cousens) ;

A. R. Horwood, and C. W. F. Noel, 3rd Earl of Gainsborough, *Flora of Leicestershire and Rutland* (from Mr. Horwood) ; W. F. Kirby, *European butterflies and moths, with* 61 [62] *coloured plates*, 1889 (from Mr. J. H. Holland) ; A. Luisier, *Musci salmanticenses*, 1924 (from Mr. P. W. Richards) ; D. T. MacDougal, and E. B. Working, *The pneumatic system of plants, especially trees* (from the Carnegie Institution of Washington) ; A. Osborn, *Shrubs and trees for the garden* (from Messrs. Ward, Lock & Co.) ; R. N. Parker, *Common Indian trees* (from Manager of Publications, Delhi) ; R. S. Pearson, and H. P. Brown, *Commercial timbers of India*, 2 vols., 1932 (from High Commissioner for India) ; Messrs. Sanders, (1) *Sanders' orchid guide, revised* (1927) *edition* and (2) *Orchid hybrids : Sanders' complete list*, 2 vols. (in one), 1921 and 1931 (2 copies) (from Messrs. Sanders) ; W. Suksdorf, *Werdenda : Beiträge zur Pflanzenkunde*, Bd. i, nos. 5–8, 1931 (from State College of Washington) ; C. B. Tahourdin, *Native orchids of Britain*, 1925 ; T. Tanaka, *Citrus studies* ; J. McL. Thompson, *Studies in advancing sterility*, pt. VI, in *Publications of the Hartley Botanical Laboratories*, No. 11 ; C. H. Wehdeman, *A description of trees and curious plants in the interior of the promontory of the Cape of Good Hope, illustrated with* 60 *drawings . . . from nature* (an unpublished, rare work from the Rev. Canon F. W. Galpin) ; A. White, and B. L. Sloane, *The Stapelieae* ; R. O. Williams, *Gardening in the tropics, revised edition*. Those of which the year of publication is not stated were issued in 1933.

The number of periodical publications presented is large and space is limited, so that the following represent only some titles additional to those mentioned in recent reviews. They are sent by the editors, societies or institutions issuing them, unless otherwise stated : *Acta Botanica Fennica* (Societas pro Fauna et Flora Fennica) 10–11, 1931–33 ; *Acta pro Fauna et Flora Universali* (Bucarest), *Ser.* II, *Botanica*, Vol. i, Nos. 1–4 and 7–8 (1932–33) ; *Acta Instituti et Horti Botanici Universitatis Tartuensis* (*Dorpatensis*), vol. iii, fasc. 1–4 ; *Acta Phytochimica*, vol. vii, No. 1 ; *Annals of the Royal Botanic Garden, Calcutta*, vol. xiii, 1931, 1 vol. of text and 102 plates (His Excellency the Governor of Bengal) ; *Annuario della Reale Accademia d'Italia*, iv, 1931–32 ; *Archives de l'Institut Botanique de l'Université de Liége*, vols. vii–ix, 1928–32 ; *Boletim da Sociedade de Estudos da Colónia de Moçambique*, Ano i, nos. 1–6, and Ano ii, nos. 7–10 ; *Botanical Museum Leaflets*, Nos. 4–10 ; *Bulletin international, Académie Tchèque des Sciences*, etc., Année xxxi and xxxii, 1930 and 1931 ; *Bulletin of the College of Agriculture and Forestry, University of Nanking*, Nos. 2–7 and 9–10 (New Series) ; *Bulletin of the Independent Biological Laboratories* (*Tel-Aviv, Palestine*), vol. 2, No. 1 ; *Bulletin of the Public Museum of the City of Milwaukee*, vol. vii, Nos. 1–3 and vol. xiv, No. 1 ; *Bulletin of the Shanghai Science Institute*, vol. i, Nos. 2, 3 and 5 ; *Contributions from the Botanical Laboratory of the University of Pennsylvania*, vol. x, 1932 ; *Contributions from the Herbarium of Taihoku Imperial University*, Nos. 19–31 ; *Field and Laboratory* (*Contributions from the Science Departments of the Southern Methodist University, Dallas, Texas*), vol. i, Nos. 1 and 2, vol. ii, No. 1 ; *Journal of the Elisha Mitchell Scientific Society*, vol. xlvii, No. 2, 1932 ; *Journal of the Faculty of Science, Hokkaido Imperial University, Series* V (*Botany*), vol. ii, No. 4 ; *Journal of the Faculty of Science, Imperial University of Tokyo*, vol. iii, pt. 2, 1931, and vol. iv, pt. 1, 1932 ; *Journal of the Natural History Society of Siam*, vol. iv, No. 3 (from Dr. A. F. G. Kerr) ; *Mededeelingen van het Botanisch Instituut der Rijks-Universiteit Gent*, 1 Jaarg., 1932 ; *Meddelanden fran Lunds Botaniska Museum*, Nos. 11 and 12 ; *Mémoires de l'Académie Malgache*, fasc. xii, 1932 ; *Nederlandsch Indische Vereeniging tot Natuurbescherming* : *Verslag over de Jaren* 1929–31 ; *The Onderstepoort Journal*, vol. i, No. 1 (from Director, Veterinary Services and Animal Industry, Onderstepoort, Pretoria) ; *Phytologia, edited and published by H. A. Gleason and H. N. Moldenke*, New York Botanical Garden, vol. i, No. 1 ; *The Phytopathological Laboratory, Taihoku Imperial University, Contributions*, Nos. 13–20 ; *Publications of the Botanical Institute, Science Department, Kyoto Imperial University*, Nos. 31–33 ; *Publications of the Hartley Botanical Laboratories*, Nos. 9–10 ; *Report of the* 31*st Annual Meeting of the South African Association for the Advancement of Science* ; *Report of the Marlborough College Natural History Society*, 1932 ; *Report of the Provincial Museum of Natural History, Province of British Columbia*, 1932 ; *Revue Agrologique et Botanique*, Nos. 2–4 ; *Annual Report of the Taihoku Botanic Garden*, vol. ii, 1932 ; *Sovetskaya Botanīka*, Nos. 1–2 (Academy of Sciences, Leningrad) ; *Sunyatsenia*, vol. i, Nos. 2–3 ; *Transactions of the Academy of Science, St. Louis*, vol. xxviii, Nos. 1–2. The year of publication is 1933 unless differently stated.

Various publications have again been received from the Empire Marketing Board, the Empire Cotton Growing Corporation, the Imperial Agricultural Bureaux, and from many Departments of Botany, Agriculture and Forestry at home, in the overseas Empire, and in foreign countries.

A large number of reprints from periodicals have been received from the authors.

From the Ordnance Survey Office, Southampton, has been received a complete set of 1″-to-the-mile survey maps of Great Britain, composed mainly of the popular edition but substituted by maps of the new fifth (relief) edition so far as published. Further sheets of this later edition have been promised as they appear.

INDEX.

A.

Abies pindrow Royle, 414.
Abies Webbiana var. *pindrow* Brandis, 415.
Acacia chariessa Milne-Redhead, 143.
Acanthophora Delilei Lamour., 134.
Acrochaetium Iyengarii Boergs., 113.
Acrodiclidium debile Mez, 337.
Actinodaphne Maingayi var. *macrocarpa* Gürke, 495.
African Grasses, Notes on, 269, 498.
African Orchids, 246.
Afzelia caudata Hoyle, 170.
Agave amaniensis: a New Form of Fibre-producing Agave from Amani (with plate), 465.
—— —— Trelease et Nowell, 465.
Ahnfeltia plicata Fr., 117.
Aiouea Aubl., 210, 211.
—— *densiflora* Nees, 211.
—— *Schomburgkii* Meissn., 212.
Albertus Magnus, Botanical Terms in, 440.
—— —— Plant Morphology in, 431.
Albizzia flavovirens Hoyle, 173.
—— *struthiophylla* Milne-Redhead, 144.
Aloë ortholopha Christian et Milne-Redhead (with plate) 478.
Alopecurus typhoides Burm., 271.
Alseis longifolia Ducke, 333.
Alsodeia Dawei Sprague, 467.
Amphicome arguta Royle ex G. Don, 386.
—— *diffusa* Sprague, 386.
Amphorchis occidentalis Lindl., 246, 252.
Andropogon speciosus Nees, 354.
Anemopaegma tobagense Urb., 322.
Aniba Aubl., 210, 212.
—— *anisosepala* Sandwith, 336.
—— *megacarpa* Hemsl., 213.
—— *panurensis* Mez, 214.
—— *trinitatis* Mez, 212.
Anisopappus Smutsii Hutch., 425.
Anthephora gracilis Stapf et C. E. Hubbard, 271.
Appointments—
  Burtt, B. L., 48.
  Williams, R. F., 409.
Appunia aurantiaca Sandwith, 334.
Aquilaria Agallocha Roxb., 4.
—— *malaccensis* Lamk., 5.
Ardisia bifaria White et Francis, 45.
Arenaria geniculata Poir., 408.
Argentine, New Species of Nototriche and Malvastrum from the, 485.
Arisaema Barnesii C. E. C. Fischer (with fig.), 340, 342.
—— *Jacquemontii* Bl., 339, 340.
—— *Leschenaultii* Bl., 339, 348.
—— *tortuosum* Schott, 340, 349.
—— *translucens* C. E. C. Fischer (with fig.), 340, 344.
—— *tylophorum* C. E. C. Fischer (with fig.), 340, 346.
—— *Wightii* Schott, 339, 340, 341.
Arthrophyllum Havilandi Ridley, 494.
Asparagopsis Sandfordiana Harv., 114.
Aster alpinus and allied species, 48.
Asterolepidium elatum Ducke, 331.
Athraxon depressus Stapf ex C. E. C. Fischer, 349.
—— *villosus* C. E. C. Fischer, 350.
Aydendron citrifolium Griseb., 213, 227.
—— *sericeum* Griseb., 227.

B.

Banara guianensis Aubl., 326.
Bangia elegans Chauvin, 113.
Barber, C. A. (obit.), 157.
Barker, Miss W., 462.
Basanacantha asperifolia Sandwith, 333.
Beckeropsis Pirottae Stapf et C. E. Hubbard, 269.
—— *procera* Stapf, 272.
—— *uniseta* K. Schum., 269.
Bentham-Moxon Fund, 1.
Boergesen, F., Some Indian Rhodophyceae especially from the Shores of the Presidency of Bombay (with plates and figs.), 113.
Books :—
  Botanical Magazine, 47, 111, 256, 367, 508.
  Cactus and its Home, the, 48.
  Commercial Timbers of India, their Distribution, Supplies, Anatomical Structure, Physical and Mechanical Properties and Uses, 504.
  Flora Capensis, 367.
  Flora of Leicestershire and Rutland, 509.
  Flora of Surinam, the, 415.
  Flora of the South Indian Hill Stations, 507.
  Florida Wild Life, 255.

Books—*cont.*
  Geographisch-Morphologische Studien über Aster alpinus L. und verwandte Arten, 48.
  Hong Kong Naturalist, the, 507.
  Hooker's Icones Plantarum, 510.
  Medicinal and Poisonous Plants of Southern Africa, the, 463.
  Natural Varnish Resins, 159.
  Romance of Empire Drugs, the, 112.
  Romance of Plant Hunting, the, 304.
  Sempervivums, 47.
  Shrubs and Trees for the Garden, 512.
  Spices and Condiments, 505.
Borneo and other Malay Islands, Additions to the Flora of, 190.
Boschia oblongifolia Ridley, 488.
Botanical Magazine (review), 47, 111, 256, 367, 508.
Boyce Thomson Southwestern Arboretum, 208.
Brachiaria stipitata C. E. Hubbard, 498.
Brachyachne fibrosa C. E. Hubbard, 502.
—— *obtusiflora* C. E. Hubbard, 503.
—— *patentiflora* C. E. Hubbard, 503.
British Guiana, Preliminary List of Diseases of Economic Plants in, 107.
—— —— Three New Monocotyledons from, 495.
British North Borneo, Contributions towards a Flora of, 487.
Brooks, R. L. Notes on the Trinidad and Tobago species of Lauraceae, 209.
Buchanania aruensis Ridley, 195.
—— *fragrans* Ridley, 195.
—— —— var. *oblanceolata* Ridley, 195.
—— *glaberrima* Ridley, 195.
Buchnerodendron stipulatum Bullock, 468.
Bullock, A. A., Flora of Mount Elgon. Enumeration of Plants, 58.
Burma, Contributions to the Flora of, 364.

C.

Cactus and its Home, the (review), 48.
Callithamnion byssoides Arn., 125.
Caloglossa bombayensis Boergs., 127.
—— *Leprieurii* J. Agardh, 127.
Calpocalyx cauliflorus Hoyle, 172.
Cambridge Cottage Garden, new Shelter in, 254.
Campnosperma squamatum Ridley, 197.
Canoes, Central African (with plates and fig.), 202.
Canthium Burttii Bullock, 146.
Caralluma tessellata Pillans, 187.
Carex Mannii E. A. Bruce, 150.
Carpotroche surinamensis Uitt., 325.
Carludovica angustissima Sandwith, 497.
Casearia Rusbyana Briq., 326.
Cassytha L., 211, 225.
—— *filiformis* L., 226.
Catapodium loliaceum Link, 407.
Catenella Opuntia Grev., 116.
—— *repens* Batters, 116.
Caulacanthus ustulatus Kütz., 115.
Cedrela odorata L., 331.
Cenchrus perinvolucratus Stapf et C. E. Hubbard, 299.
—— *pycnostachyus* Steud., 270.
Ceratophytum Pittier, 322.
—— *brachycarpum* Pittier, 322.
—— *capricorne* Pittier, 322.
—— *tobagense* Sprague et Sandwith, 322.
Ceropegia filicalyx Bullock, 145.
Champia compressa var. *scindica* Boergs., 117.
—— —— *f. somalensis* De Toni, 119.
—— *indica* Boergs., 120.
—— *parvula* Harv., 122.
—— *somalensis* Hauck, 119.
Chlamydocarya rostrata Bullock, 469.
Chondria dasyphylla Ag., 133.
—— —— var. *stellata* Boergs., 133.
—— *parvula* Ag., 122.
—— *tenuissima* Ag., 132.
Chondrococcus Hornemanni Schmitz, 117.
—— *Lambertii* Suhr, 117.
Chrysanthemum praeteritum Horwood, 44.
Cinnamomum Spreng., 210, 214.
—— *Camphora* Nees et Eberm., 215.
—— *zeylanicum* Nees, 215.
Cinnamosma fragrans Baill., 12.
Claudea elegans Lamour., 132.
Clavapetalum elatum Ducke, 331.
Coffee, Coroa, 413.
Coleus Daviesii E. A. Bruce, 477.
Commiphora Drake - Brockmannii Sprague, 511.
Condiments, Spices and (review), 505.
Cordia fragrantissima Kurz, 11.
—— *trichotoma* Arrab. ex Steud., 335.
Coroa Coffee, 413.
Craib, W. G. (obit.), 367, 409.

Craibiodendron Henryi W. W. Smith, 365.
Crassula retrorsa Hutch., 420.
Craterostigma lindernioides E. A. Bruce, 474.
Crotalaria vialis Milne-Redhead, 469.
Cryptocarya cinnamomifolia Merrill, 46.
—— *Merrillii* C. T. White, 46.
Cynorchis debilis Summerhayes, 246.
—— *occidentalis* Dur. et Schinz, 246.
Cyprus, some Notes on the Troodos Pine of, 228.
—— Two Plants New to the Flora of, 407.

D.

Dallimore, W. Fastigiate and Pyramidal Larches, 303.
Decades Kewenses: Decas cxxix, 184.
Delesseria Leprieurii Mont., 127.
Desmia Hornemanni Lyngb., 117.
Dictymenia fraxinifolia J. Agardh, 137.
Dictyurus purpurascens Bory, 136.
Dimeria bialata C. E. C. Fischer, 351.
Dimorphotheca nervosa Hutch., 426.
Dioscoreae Novae Asiaticae, 240.
Dioscorea sect. *Illigerastrum* Prain et Burkill, 241.
—— *Bonii* Prain et Burkill, 244.
—— *depauperata* Prain et Burkill, 245.
—— *dissimulans* Prain et Burkill, 241.
—— *filicaulis* Prain et Burkill, 242.
—— *intempestiva* Prain et Burkill, 243.
—— *lamprocaula* Prain et Burkill, 245.
—— *Petelotii* Prain et Burkill, 240.
—— *Poilanei* Prain et Burkill, 240.
—— *Potanini* Prain et Burkill, 243.
Diplopterys includens Ndz., 326.
Disperis cordata Summerhayes, 252.
—— *Mildbraedii* Schltr., 253.
Disperma crenatum Milne-Redhead, 477.
—— *quadrisepalum* C. B. Clarke, 477.
—— *trachyphyllum* Bullock, 476.
Drabble, E. (obit.), 413.
Dracontomelum brachyphyllum Ridley, 202.
—— *Cumingianum* Baill., 202.
—— *sylvestre* Bl., 202.
Drugs, the Romance of Empire (review), 112.
Dunkal Gum, 511.
Dunkley, H. and Hoyle, A. C. New Trees and Shrubs from Tropical Africa, 170.
Dyer, R. A. Notes on the Flora of Southern Africa, 459.

E.

Echinocaulon acerosum Boergs., 116.
—— *rigidum* Kütz., 116.
Ehrharta longigluma C. E. Hubbard, 501.
Elaeocarpus longipetiolatus C. T. White, 45.
—— *Michaelii* C. T. White, 45.
Elgon, Flora of Mount, 49.
Elionurus Trapnellii C. E. Hubbard, 498.
Elms of Western Thrace, the, 232.
Endlicheria sericea Nees, 227.
Epineuron fraxinifolium Harv., 137.
Eragrostis Beauv., 16.
—— *cilianensis* Vignolo-Lutati, 17.
Eragrostis major and E. minor, 15.
Eragrostis poaeoides Beauv., 17.
Erica Fourcadei L. Bolus, 185.
—— *Holtii* Schweickerdt, 185.
—— *Keetii* L. Bolus, 186.
—— *leucosiphon* L. Bolus, 186.
Erioglossum rubiginosum Bl., 490.
Erythrina lysistemon Hutch., 422.
Erythroxylum vernicosum O. E. Schulz, 326.
Eugenia incarnata Elmer, 493.
Euphorbia antiquorum L., 9.
—— *imbricata* E. A. Bruce, 468.
Evans, Dr. I. B. Pole, 304, 512.
Excoecaria africana Muell. Arg., 6.
—— *Agallocha* L., 8.

F.

Fagara melanorrhachis Hoyle, 174.
Falkenbergia rufolanosa Schmitz, 132.
Ficus stolonifera King, 495.
Fischer, C. E. C. Contributions to the Flora of Burma, 364.
Flora Capensis (review), 367.
Flora of Borneo and other Malay Islands, Additions to, 190.
—— British North Borneo, Contributions to a, 487.
—— Burma, Contributions to the, 364.
—— Cyprus, two Plants New to the, 407.
—— Leicestershire and Rutland (review), 509.
—— Mt. Elgon, the, 49.
—— the Nearer East, on the, 232.

Flora of Siam, Contributions to, 18.
—— Southern Africa, Notes on, 459.
—— the South Indian Hill Stations (review), 507.
—— Tropical America, Contributions to, 321, 323, 390, 495.
Florida Wild Life (review), 255.
Flowers, the Protection of Wild, 160.
Fockea cylindrica R. A. Dyer, 459.
—— *gracilis* R. A. Dyer, 459.
Foggie, A. Some Notes on the Troodos Pine of Cyprus, 228.
Fucus acerosus Forssk., 116.
—— *aeruginosus* Turner, 124.
—— *coccineus* Huds., 123.
—— *foliifer* Forssk., 124.
—— *fraxinifolius* Mert., 137.
—— *Hornemanni* Mert., 117.
—— *lacinulatus* Vahl, 124.
—— *lichenoides* Esp., 125.
—— *papillosus* Forssk., 134.
—— *plicatus* Huds., 117.
—— *Opuntia* Good. et Woodw., 116.
—— *repens* Lightf., 116.
—— *rigidus* Vahl, 116.
—— *tenuissimus* Good. et Woodw., 132.
—— *ustulatus* Mert., 115.

G.

Gelidiopsis rigida Weber van Bosse, 116.
Gelidium pusillum Le Jolis, 114.
Glaucium flavum, a Study of Variation in, 174.
Glaucium Serpieri Heldreich, 43.
Gluta laxiflora Ridley, 196.
Gnidia cluytioides E. A. Bruce, 143, 256.
Goniotrichum elegans Le Jolis, 113.
Gonostylus bancanus Baill., 10.
Gracilaria corticata J. Agardh, 124.
—— —— var. *ramalinoides* J. Agardh, 124.
—— *foliifera* Boergs., 124.
—— *lacinulata* Howe, 124.
—— *multipartita* J. Agardh, 124.
—— *spinescens* Kütz., 125.
Green, M. L. and Sprague, T. A. Northea Hornei or N. seychellana, 206.
—— —— Silene Cucubalus: the Correct Name of the Bladder-Campion, 151.
—— —— The History of Nothopanax, 154.
Greenish, H. G. (obit.), 412.
Grewia antidesmifolia var. *hirsuta* King, 489.
Guarea Davisii Sandwith, 330.
Guazuma ulmifolia Lam., 326.
Guettarda acreana Krause, 333.
Guizotia oblonga Hutch. et Bullock, 85, 150, 256.

H.

Habenaria angustissima Summerhayes, 249.
—— *brachylobos* Summerhayes, 248.
—— *debilis* Hook. f., 246.
—— *Holstii* Kraenzl., 247.
—— *kilimanjari* Rchb. f., 249.
—— *lutaria* Schltr., 249.
—— *malacophylla* Rchb. f., 247.
—— *martialis* Rchb. f., 249.
—— *obovata* Summerhayes, 252.
—— *occidentalis* Summerhayes, 246, 252.
—— *Petitiana* Dur. et Schinz, 247.
—— *pulla* Schltr., 247.
—— *Rendlei* Rolfe, 251, 252.
—— *Theodori* Kraenzl., 249.
—— *Tweedieae* Summerhayes, 248.
—— *Uhligii* Kraenzl., 249.
Harpullia confusa Bl., 192.
—— *tomentosa* Ridley, 192.
Helichrysum acrobates Bullock, 149.
Herminium Steudneri Rchb. f., 247.
Hibiscus aridus R. A. Dyer, 460.
Hill, A. W. New Species of Nototriche and Malvastrum from the Argentine, 485.
Hirtella obidensis Ducke, 333.
Hoeckia Aschersoniana Engl. et Graebn., 364.
Hong Kong Naturalist, the, 507.
Hooker's "Companion to the Botanical Magazine," the Dates of, 362.
—— Icones Plantarum (review), 510.
Horwood, A. R. A New Pyrethrum, 44.
Howes, F. N. Variability in Stock-Poison Plants, 305.
Hoyle, A. C. and Dunkley, H. New Trees and Shrubs from Tropical Africa, 170.
Hubbard, C. E. Notes on African Grasses, 498.
—— and Stapf, O. Notes on African Grasses, 269.
—— and Sprague, T. A. Eragrostis major and E. minor, 15.
*Huernia Vereker*i Stent, 145.
Hutchinson, J. Petrosavia and Protolirion, 156.
—— The Genus Trichocladus Pers., 427.
Hygrophila crenata Lindau, 477.

I.

Incarvillea diffusa Royle, 386.
India, New or Little-Known Plants from South, 339.
Indian Timbers, 504.
International Botanical Conference, 1935, Sixth, 503.
Irina alnifolia, Bl., 192.
—— *tomentosa* Bl., 192.
Isachne aethiopica Stapf et C. E. Hubbard, 300.
—— *Gossweileri* Stapf et C. E. Hubbard, 301.
—— *guineensis* Stapf et C. E. Hubbard, 302.
Ischaemum aristatum K. Ranga Achariyar, 353.
—— *corollatum* Nees, 354.
—— *Rangacharianum* C. E. C. Fischer, 352.
—— *travancorense* Stapf ex C. E. C. Fischer, 353.
Isidorus, Botanical Terms in, 401.

J.

Jackson, A. K. Two Plants New to the Flora of Cyprus, 407.

K.

Kandelia Candel Merr., 493.
Khaya nyasica Stapf (with fig.), 204.

L.

Lacaita, C. C. (obit.), 462.
Lagynias littoralis Bullock et Greenway, 148.
Larches, Fastigiate and Pyramidal, 303.
Larix decidua forma *fastigiata* Dallimore, 303.
—— —— —— *pyramidalis* Dallimore, 303.
—— *laricina* forma *pyramidalis* Dallimore, 304.
Lasianthus aristatus Craib, 18.
—— *bicolor* Craib, 19.
—— *brevidens* Craib, 19.
—— *brevipes* Craib, 20.
—— *chartaceus* Craib, 20.
—— *Foxworthyanus* Craib, 21.
—— *incomptus* Craib, 21.
—— *lineolatus* Craib, 22.
—— *maculatus* Craib, 22.
—— *marginatus* Craib, 23.
—— *penicillatus* Craib, 23.
—— *puberulus* Craib, 24.
—— *Rabilii* Craib, 24.
—— *sarmentosus* Craib, 25.
Lasianthus saxorum Craib, 25.
—— *scalaris* Craib, 26.
—— *setosus* Craib, 26.
—— *subaureus* Craib, 27.
—— *subcalvus* Craib, 27.
—— *virgatus* Craib, 28.
Lasiostoma cirrhosa Willd., 400.
—— *divaricata* G. F. W. Mey., 400.
Lauraceae, Notes on the Trinidad and Tobago species of, 209.
Laurencia cruciata Harv., 135.
—— *obtusa* var. *majuscula* Harv., 135.
—— *pannosa* Zan., 135.
—— *papillosa* Grev., 134.
—— *pedicularioides* Boergs., 136.
Lepidocordia punctata Ducke, 335.
Leucaena Ulei Harms, 333.
Litsea reticulata F. Muell. 46.
Lobelia Burttii E. A. Bruce, 473.
Loranthus ngurukizi E. A. Bruce, 470.
Lord, C. E. (obit.), 366.
Loxopterygium Sagoti Hook. f., 332.
Lugard, E. J., Flora of Mount Elgon. General Introduction, 49.

M.

Macfarlane, J. M. and Steckbeck, D. W. Sarracenia purpurea var. stolonifera (with plates), 161.
Macrolobium Vignei Hoyle, 171.
Malvastrum and Nototriche from the Argentine, New Species of, 485.
Malvastrum tuberculatum A. W. Hill, 486.
Mangifera Beccarii Ridley, 194.
—— *foetida* Lour., 194.
—— *Havilandi* Ridley, 194.
—— *longipes* Griff., 194.
—— *odorata* Griff., 194.
—— *sclerophylla* Hook. f., 194.
Manisuris divergens O. Ktze., 354.
—— *forficulata* C. E. C. Fischer, 355.
—— —— var. *hirsuta* C. E. C. Fischer, 357.
Mansonia Gagei J. R. Drumm., 12.
Mapanea fluviatilis, Sandwith, 495.
—— *insignis* Sandwith, 496.
Marsden-Jones, E. M. and Turrill, W. B. Researches on Silene maritima and S. vulgaris: xi. Genetics of Petal Size and of other Characters in S. maritima, 357. xii. A Statistical Study of Characters in two Wild Populations of S. maritima, 479.
Martyn, E. B. Preliminary List of Diseases of Economic Plants in British Guiana, 107.

Medicinal and Poisonous Plants of Southern Africa, the (review), 463.
Medinilla gratiosa Stapf, 184.
Melanochyla axillaris Ridley, 198.
Melanocommia Ridley, 198.
—— *borneënsis* Ridley, 198.
Melanorrhoea speciosa Ridley, 197.
—— *tricolor* Ridley, 196.
Meliosma grandifolia Lecomte, 193.
—— *latifolia* Ridley, 193.
—— *sarawakensis* Ridley, 193.
Membranoptera Murrayi Boergs., 130.
Memecylon caloneuron Miq., 494.
—— *paniculatum* Miq., 494.
Metcalfe, C. R. The Structure and Botanical Identity of some Scented Woods from the East (with plates), 3.
Microchloa obtusiflora Benth., 503.
—— *patentiflora* Stent et J. M. Rattray, 503.
Microcos Creaghii Ridley, 490.
—— *reticulata* Ridley, 490.
Minuartia geniculata Thell., 408.
Misanteca Duckei Sampaio, 338.
Miscellaneous Notes, 46, 110, 157, 208, 254, 304, 366, 408, 462, 503.
Mischocarpus sundaicus Bl., 192.
Morris, Daniel (obit.), 110.
Moxon Memorial Bequest, 1.
Mucuna sempervirens Hemsl., 364.
Myroxylon sp., 332.

N.

Nectandra Roland, 210, 221.
—— *antillana* Meissn., 227.
—— *dominicana* Mez, 227.
—— *leucantha* Griseb., 227.
—— *martinicensis* Mez, 222.
—— *membranacea* Griseb., 223.
—— *mollis* Griseb., 227.
—— *rectinervia* Meissn., 222.
—— *sanguinea* Griseb., 227.
—— *strumosum* Mez, 227.
—— *surinamensis* Mez, 221.
Nepeta lamiopsis Benth., 366.
Nephelium glabrum Bl., 191.
—— *Hosei* Ridley, 191.
—— *obovatum* Ridley, 191.
—— *sufferrugineum* Radlk., 191.
Neurymenia fraxinifolia J. Agardh, 137.
Northea Hornei or N. seychellana, 206.
Nothopanax, the History of, 154.
Nothopanax cochleatum Miq., 155.
Nothopegia borneënsis Ridley, 197.
Nototriche and Malvastrum from the Argentine, New Species of, 485.
Nototriche caesia A. W. Hill, 486.
—— *rosulata* A. W. Hill, 485.

O.

Obituary Notices :—
Barber, C. A., 157.
Craib, W. G., 367, 409.
Drabble, E., 413.
Greenish, H. G., 412.
Lacaita, C. C., 462.
Lord, C. E., 366.
Malte, M. O., 463.
Morris, Daniel, 110.
Popenoe, Mrs. Wilson, 304.
Stapf, Otto, 366, 369.
Ocotea Aubl., 210, 215.
—— *arenaensis* R. L. Brooks, 217.
—— *canaliculata* Mez, 219, 338.
—— *Eggersiana* Mez, 218.
—— *fasciculata* Mez, 218.
—— *floribunda* Mez, 227.
—— *glomerata* Mez, 219.
—— *Hartiana* Mez, 220.
—— *leucoxylon* Mez, 216.
—— *oblonga* Mez, 220.
Oncoba stipulata Oliv., 468.
Ophiorrhiza umbricola W. W. Smith, 364.
Ormosia Coutinhoi Ducke, 332.
Ostodes macrophylla Benth., 495.
Otiophora caerulea Bullock, 471.
Otophora glandulosa Radlk. ex Ridley, 490.
—— *latifolia* Ridley, 190.
—— *macrocarpa* Ridley, 190.
Ouratea superba Engl., 327.
Oxygonum fruticosum Dammer ex Milne-Redhead, 142.

P.

Paederia hirsuta Craib, 28.
—— *pallida* Craib, 28.
—— *pilosa* Craib, 29.
Palaquium Sukoei C. E. C. Fischer, 365.
Panicum glaucocladum C. E. Hubbard, 501.
—— *subangustum* Schumacher, 271.
Paranephelium nitidum King, 192.
Parishia borneënsis Ridley, 200.
—— *Lowei* Ridley, 201.
—— *minor* Ridley, 201.
—— *polycarpa* Ridley, 200.
—— *sericea* Ridley, 201.
Parkia ingens Ducke, 333.
—— *nitida* Miq., 332.
—— *Ulei* Kuhlm., 333.

Penicillaria fallax Fig. et De Not., 270.
—— *Sieberiana* Schlechtd., 270.
—— *stenostachya* Klotzsch ex A. Br., 270.
—— *typhoides* Schlechtd., 271.
—— *vulpina* A. Br., 270.
Pennisetum albicauda Stapf et C. E. Hubbard, 294.
—— *ancylochaete* Stapf et C. E Hubbard, 294.
—— *atrichum* Stapf et C. E. Hubbard, 282.
—— *Barteri* Stapf et C. E. Hubbard, 287.
—— *catabasis* Stapf et C. E. Hubbard, 281.
—— *Chevalieri* Stapf et C. E. Hubbard, 285.
—— *cinereum* Stapf et C. E. Hubbard, 298.
—— *Dalzielii* Stapf et C. E. Hubbard, 290.
—— *darfuricum* Stapf et C. E. Hubbard, 283.
—— *Davyi* Stapf et C. E. Hubbard, 278
—— *Dowsonii* Stapf et C. E. Hubbard, 279.
—— *echinurus* Stapf et C. E. Hubbard, 270.
—— *exile* Stapf et C. E. Hubbard, 277.
—— *fallax* Stapf et C. E. Hubbard, 270.
—— *Franchetianum* Stapf et C. E. Hubbard, 277.
—— *gambiense* Stapf et C. E. Hubbard, 297.
—— *gibbosum* Stapf et C. E. Hubbard, 299.
—— *glaucocladum* Stapf et C. E. Hubbard, 276.
—— *Gossweileri* Stapf et C. E. Hubbard, 274.
—— *gracile* Benth., 271.
—— *grandiflorum* Stapf et C. E. Hubbard, 280.
—— *Haareri* Stapf et C. E. Hubbard, 273.
—— *leonis* Stapf et C. E. Hubbard, 296.
—— *macropogon* Stapf et C. E. Hubbard, 275.
—— *Maiwa* Stapf et C. E. Hubbard, 297.
—— *malacochaete* Stapf et C. E. Hubbard, 295.
—— *massaicum* Stapf, 273.
Pennisetum niloticum Stapf et C. E. Hubbard, 293.
—— *ochrops* Stapf et C. E. Hubbard, 284.
—— *orthochaete* Stapf et C. E. Hubbard, 292.
—— *perspeciosum* Stapf et C. E. Hubbard, 291.
—— —— var *Lynesii* Stapf et C. E. Hubbard, 291.
—— *Pirottae* Chiov., 269.
—— *pycnostachyum* Stapf et C. E. Hubbard, 270.
—— *Rogeri* Stapf et C. E. Hubbard, 285.
—— *robustum* Stapf et C. E. Hubbard, 286.
—— *salifex* Stapf et C. E. Hubbard, 279.
—— *Sampsonii* Stapf et C. E. Hubbard, 289.
—— *scleroclaďum* Stapf et C. E. Hubbard, 288.
—— *Sieberianum* Stapf et C. E. Hubbard, 270.
—— *stenorrhachis* Stapf et C. E. Hubbard, 270.
—— *stenostachyum* Stapf et C. E. Hubbard, 270.
—— *subangustum* Stapf et C. E. Hubbard, 271.
—— *tenue* Mez, 270.
—— *typhoides* Stapf et C. E. Hubbard, 271.
—— *vulpinum* Stapf et C. E. Hubbard, 270.
Pentanisia caerulea Hiern, 471.
Pentas graniticola E. A. Bruce, 146.
Pentaspadon teleianthera Ridley, 199.
Peristylus Bl., 247.
—— *Snowdenii* Rolfe, 247.
—— *ugandensis* Rolfe, 247.
Persea Mill., 211, 224.
—— *americana* Mill., 224.
Petrosavia and Protolirion, 156.
Petrosavia stellaris Beccari, 156.
Phacelurus speciosum C. E. Hubbard, 354.
Phoebe Nees, 211, 224.
—— *elongata* Nees, 225.
—— —— var. *elliptica* R. L. Brooks, 225.
—— —— var. *lanceolata* R. L. Brooks, 225.
—— *opaca* Bl., 495.
Picea pindrow, D. Don, **414**.
Pinus laricio var. *Pallasiana* Endl., 228.

Pinus nigra var. *caramanica* Rehd., 228.
—— *Pallasiana* Lambert, 229.
—— *pindrow* D. Don, 414.
Piper moraballianum Trel., 338.
—— *Wachenheimii* Trel., 339.
Pithecellobium Elmeri Ridley, 492.
—— *Havilandi* Ridley, 493.
Plant Morphology in Albertus Magnus, 431.
Platanthera Volkensiana Kraenzl., 247.
Platycoryne megalorrhyncha Summerhayes, 250.
Pliny's Natural History, Botanical Terms in, 30.
Plocamium coccineum Lyngb., 123.
—— *Telfairiae* Harv., 123.
Poa loliacea Huds., 407.
Podostemaceae or Podostemonaceae, 46.
Polygonum viviparum Linn., 366.
Polyscias J. R. et G. Forst., 155.
—— *pinnata* J. R. et G. Forst., 155.
Pometia alnifolia Teysm., 192.
Popenoe, Mrs. Wilson (obit.), 304.
Protection of Wild Flowers, the, 160.
Protium crenatum Sandwith, 327.
—— *Sagotianum* March., 327.
Protolirion, Petrosavia and, 156.
Protolirion paradoxum Ridley, 156.
Pseudotreblus indica Bur., 366.
Psilotrichum filiforme E. A. Bruce, 467.
Psittacanthus plagiophyllus Eichl., 338
Pterospermum Stapfianum Ridley, 489.
Pulicaria attenuata Hutch. et B. L. Burtt, 149.
Pygmaeothamnus concrescens Bullock, 471.
Pyrenaria parviflora Ridley, 487.
Pyrethrum, a new, 44.
Pyrethrum Aucherianum DC., 45.

Q.

Quercus lodicosa E. F. Warburg, 188.
—— *suchiensis* E. F. Warburg, 188.

R.

Randia asperifolia Sandwith, 333.
Rauia Ulei Krause, 327.
Rhamphicarpa filicalyx E. A. Bruce, 475.
Rhodalsine geniculata Williams, 408.
Rhodomenia corticata J. Agardh, 124.
Rhodophyceae, Indian (with plates and figs.), 113.
Rhus perakensis King, 193.
Ridley, H. N. Additions to the Flora of Borneo and other Malay Islands, 190.
Rinorea Dawei Bullock, 467.
—— *endotricha* Sandwith, 324.
—— *Lindeniana* Kze., 325.
—— *micrantha* Ule, 325.
Roeperocharis Rchb. f., 251.
—— *occidentalis* Kraenzl., 251, 252.
—— *Rendlei* Kraenzl., 251.
—— *ukingensis* Schltr., 251, 252.
Romance of Plant Hunting, the (review), 304.
Rottboellia divergens Hack., 354.
Rouhamon guianensis Aubl., 400.
—— *divaricatum* DC., 400.
Roupala suaveolens var. *minor* Meisn., 338.
Royle's Illustrations, the Dates of Publication of, 378.
Rubia Garrettii Craib, 29.
Rudgea tanaosepala Sandwith, 334.

S.

Saintpaulia alba E. A. Bruce, 475.
Sandwith, N. Y. Contributions to the Flora of Tropical America: XVI. New species and first records from British Guiana, mainly collected by Mr. T. A. W. Davis, 323. XVII. The Genus Strychnos in British Guiana and Trinidad, 390. XVIII. Three New Monocotyledons from British Guiana, 495.
—— and Sprague, T. A. Contributions to the Flora of Tropical America: XV. The Genus Ceratophytum, 321.
Saraca crassifolia Ridley, 491.
—— *Elmeri* Ridley, 492.
Sarcodia dichotoma Boergs., 122.
Sarracenia purpurea var. *stolonifera* (with plates), 161.
Satyrium occultum Rolfe, 252.
—— *zombense* Rolfe, 252.
Scabiosa siamensis Craib, 30.
Scented Woods from the East, the Structure and Botanical Identity of some (with plates), 3.
Schefflera elliptica Harms, 494.
Schoemanskloof, Eastern Transvaal, the Vegetation of, 417.
Sciaphila purpurea Benth., 338.
Sebaea cleistantha R. A. Dyer, 461.
Seeds, viability of, 257.

Semecarpus lanceolatus Ridley, 199, 491.
—— *rufo-velutinus* Ridley, 199.
Sempervivums (review), 47.
Shrubs and Trees for the Garden (review), 512.
Siam, Contributions to the Flora of, 18.
Silene conica L., 42.
Silene Cucubalus: the Correct Name of the Bladder-Campion, 151.
—— maritima and S. vulgaris, Researches on, 357, 479.
—— subconica and S. juvenalis, 40.
Silene Tempskyana Freyn et Sintenis, 42.
Silvia Duckei Sampaio, 338.
Skan, S. A. (retirement), 462
Smuts, J. C. The Vegetation of Schoemanskloof, Eastern Transvaal, 417.
Sonerila Gibbsiae Ridley, 494.
Southern Africa, Medicinal and Poisonous Plants of (review), 463.
—— Notes on the Flora of, 459.
South Indian Hill Stations, Flora of the (review), 507.
Spices and Condiments (review), 505.
Sprague, T. A. Botanical Terms in Albertus Magnus, 440.
—— Botanical Terms in Isidorus, 401.
—— Botanical Terms in Pliny's Natural History, 30.
—— Plant Morphology in Albertus Magnus, 431.
—— The Dates of Hooker's "Companion to the Botanical Magazine," 362.
—— The Dates of Publication of Royle's Illustrations, 378.
—— and Green, M. L. Northea Hornei or N. seychellana, 206.
—— —— Silene Cucubalus: the Correct Name of the Bladder-Campion, 151.
—— —— The History of Nothopanax, 154.
—— and Hubbard, C. E. Eragrostis major and E. minor, 15.
—— and Sandwith, N. Y. Contributions to the Flora of Tropical America: XV. The genus Ceratophytum, 321.
Spyridia alternans Boergs., 125.
—— *ericoides* Kütz., 126.
—— *insignis* J. Ag., 126.
Stapf, Otto (obit.), 366, 369.
—— and Hubbard, C. E. Notes on African Grasses, 269.
Steckbeck, D. W. and Macfarlane, J. M. Sarracenia purpurea var. stolonifera (with plates), 161.
Sterculia Burbidgei Stapf ex Ridley, 488.
—— *Clemensiae* Ridley, 488.
—— *megistophylla* Ridley, 489.
Stock-Poison Plants, Variability in, 305.
Streptocarpus hirsutissimus E. A. Bruce, 476.
Strychnos cogens Benth., 392.
—— *diaboli* Sandwith, 395.
—— *Erichsonii* Rich. Schomb. ex Progel, 396.
—— *guianensis* Baill., 400.
—— *lanceolata* Spruce ex Benth., 400.
—— *Melinoniana* Baill., 399.
—— *Mitscherlichii* Rich. Schomb., 398.
—— *pedunculata* Benth., 397.
—— *rhexioides* Klotzsch, 395.
—— *Rouhamon* Benth., 400.
—— *smilacina* Benth., 398.
—— *tomentosa* Benth., 395.
—— *toxifera* Rob. Schomb. ex Benth., 393.
Styrax biaristatus W. W. Smith, 365.
Summerhayes, V. S. African Orchids, 246.
Surinam, the Flora of (review), 415.
Symplocos subolivacea W. R. Price, 187.

T.

Tainia quadriloba Summerhayes, 189.
Tankerville Collection of Drawings, 2.
Tapiphyllum Fadogia Bullock, 147.
—— *floribundum* Bullock, 472.
—— *grandiflorum* Bullock, 148.
Tedd, H. G. and Turrill, W. B. On the Flora of the Nearer East: XIV. The Elms of Western Thrace, 232.
Terminalia Creaghii Ridley, 493.
Tetragastris panamensis O. Kze., 328.
Tetranthera reticulata Meissn., 46.
Tetrapterys ? includens Benth., 326.
Tetrardisia bifaria C. T. White, 45.
—— *disticha* Domin, 45.
Thamnophora Telfairiae Harv., 123.
Thesium congestum R. A. Dyer, 461.
Tinnea Physalis E. A. Bruce, 150.
Torenia vagans Roxb., 366.
Toronto, University of, New Botanical Laboratories, 158.

Trichilia Cruegeriana Urb., 328.
—— *Davisii* Sandwith, 329
—— *leucastra* Sandwith, 328.
—— *oblanceolata* Rusby, 328.
—— *Smithii* C. DC., 328.
—— *surumuensis* C. DC., 328.
Trichocladus Pers., the Genus, 427.
—— *crinitus* Pers., 430.
—— *dentatus* Hutch (with fig.), 430.
—— *Goetzei* Engl., 428.
—— *grandiflorus* Oliv., 428.
—— *ellipticus* Sond., 430.
—— *malosanus* Baker, 430.
—— *peltatus* Meisn., 430.
—— *vittatus* Meisn. ex Sond., 430.
Trinidad and Tobago, Notes on the Lauraceae of, 209.
Triumfetta palmatiloba Dunkley, 170.
Troodos Pine of Cyprus, some Notes on the, 228.
Tropical Africa, New Trees and Shrubs from, 170.
—— African Plants, 142, 467.
—— America, Contributions to the Flora of, 321, 323, 390, 495.
Turner, J. H. The Viability of Seeds, 257.
Turrill, W. B. A Study of Variation in Glaucium flavum, 174.
—— Silene subconica and S. juvenalis, 40.
—— and Marsden-Jones, E. M. Researches on Silene maritima and S. vulgaris: XI. Genetics of Petal Size and of other Characters in S. maritima, 357. XII. A Statistical Study of two Wild Populations of S. maritima, 479.
—— and Tedd, H. G. On the Flora of the Nearer East: XIV. The Elms of Western Thrace, 232.

U.

Ulmus campestris Linn., 503.
—— *foliacea* Gilib., 233.
—— *nitens* Moench., 232.
Urochloa geniculata C. E. Hubbard, 499.
—— *novemnervia* C. E. Hubbard, 500.
Utricularia appendiculata E. A. Bruce, 475.

V.

Vanilla ovalifolia Rolfe, 254.
—— *ramosa* Rolfe, 254.
Varnish Resins, Natural (review), 159.
Vegetation of Schoemanskloof, Eastern Transvaal, the, 417.
Viability of Seeds, the, 257.
Vochysia crassifolia Warm., 326.

W.

Wedelia oblonga Hutch., 150.
White, C. T. Nomenclature of some Australian and Philippine Islands Plants, 45.
Williams, R. F., 409.
Winn, W. N. (retirement), 408.

X.

Xanthophyllum ellipticum Korth., 487.

Z.

Zimmermannia ovata E. A. Bruce, 468.
Zizyphus Cinnamomum Tr. et Pl., 331.
—— *melastomoides* Pittier, 332.

Printed under the authority of His Majesty's Stationery Office.
By The South Essex Recorders, Ltd., High Road, Ilford.
(40) Wt 92/33 925 3/34 S.E.R. Ltd. Gp. 9.

Indian Agricultural Research Institute (Pusa)
LIBRARY, NEW DELHI-110012

This book can be issued on or before ....

Return Date	Return Date